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BUREAU OF HYGIENE AND TROPICAL DISEASES.

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TUBERCULOSIS IN EAST AFRICA, WITH SUGGESTIONS FOR CONTROL.

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The Country and Natives.

The work on which the findings and conclusions in this paper are based was done in Tanganyika Territory from 1930 to 1937.

Tanganyika Territory is situated on the East Coast of Africa. It lies entirely in the tropics, south of Kenya and Uganda, and north of Nyasaland and Portuguese East Africa. Its population consists of 5 million Natives, mainly of Bantu origin, and there are numerous Indian traders and fewer European planters.

The population is not evenly spread over the country. Large areas are practically uninhabited, but in some fertile districts the population density is over 400 to the square mile. There are a number of towns, of which Dar es Salaam with a population of about 22,000 is the largest, but for the most part, even in the densely populated areas, Native houses are scattered, each in its own plot of land, and the conditions are rural rather than urban.

The majority of the Natives are illiterate, but there are many Government and Mission schools which provide elementary education for children, and there are a number which cater for higher standards. These may be expected to increase, and a progressive improvement in the general education of the Natives is taking place.

The pursuits of the Natives are largely agricultural and pastoral, but increasing numbers of adult males find work as labourers on plantations, mines and other commercial undertakings. The Natives engaged in agriculture live in their own districts in houses of mud and thatch, those engaged in labouring work live in camps or compounds, and certain pastoral tribes are semi-nomadic. In the daytime the Natives usually live out of doors, but at night they crowd into small badly ventilated houses or rooms, which are frequently shared by cattle or goats. This custom is probably the result of fear of theft or raids—in some places the houses are made by digging into hillsides, thus leaving only the front to be defended.

The water supply of the Natives is usually obtained from shallow wells or streams, and is not protected. Their diet consists largely of cereals or cassava, but milk is fairly commonly used, and meat and fish where available. Cattle and goats, however, are not bred for slaughter so much as for currency.

The position as regards Tuberculosis.

It is in this population that there is reason to believe that tuberculosis is now a disease of considerable and increasing importance. It has been found that even in the remote parts of the Territory half the adult population have been infected, though relatively few are diseased, and that in the populous areas the infection rate is almost equal to, and the disease rate is probably relatively higher than, that found in London. Natives in whom infection has proceeded to definite disease usually die fairly quickly from tuberculosis, and in the one place where it was possible to estimate the death rate it was found to be roughly 2·57 per thousand population (in 1927), which was almost three times as great as that of England (1925). The numbers of cases of tuberculosis diagnosed in the Territory have risen in recent years, as has happened in the other countries of East Africa, and although tuberculosis is not (as in the Gold Coast, Straits Settlements and Jamaica) the principal individual cause of death, it usually occupies the third or fourth place in the recorded lists. In the opinion of some Missionary doctors and sisters, who through long residence in one place have exceptional opportunities for observation, tuberculosis is definitely increasing in their areas.

The majority of Native tuberculous patients suffer from the pulmonary form of the disease, caused by the human type of *Myco. tuberculosis*. In these patients the sputum is usually loaded with masses of the bacilli, and since neither the common Native customs nor the common Native conception of the origin of disease forbid promiscuous spitting, exposure to droplet infection or the use of communal vessels, the opportunities for infection of contacts exist in a marked degree. It has been found, not only in Tanganyika Territory, that the family contacts of tuberculous persons are highly infected and diseased, and that they show strong sensitivity to the tuberculin test.

After the family contacts (and certain other school contacts which showed similar characteristics) the highest infection rates, the strongest average reactions to the tuberculin test, and the greatest numbers of definite cases of tuberculous disease, were found, in Tanganyika Territory, in the areas in which the population was most dense. As these areas differed from each other in climatic and other conditions, it is probable that the similarity in the tuberculosis findings depended on the closeness of the population.

These findings point to contact as the strongest factor in the spread of tuberculosis in the Natives, and it follows that methods of control should be based on that supposition.

In areas of dense population the medical facilities provided for the Natives are more easily accessible, and the hospitals and Health offices are usually more completely staffed and equipped than those in scattered districts. This has the advantage that the diagnosis of cases can be more easily effected there than in the more rural districts, and that the examination of contacts can be made with more ease and regularity. But in these areas, and especially in towns, the isolation of patients under the conditions of everyday life is difficult.

The Natives do not appreciate modern knowledge of the transmission of disease, because it has not been taught to them over a long enough period of time, and they still pass on from parent to child the old ideas of witchcraft. It is obvious that the difficulty of changing the Natives' conception of the origin of disease is great.

Suggestions for control: General remarks.

In Britain, behind the vast scheme dealing particularly with tuberculosis, is the legislation and public knowledge which has resulted in the improvement in housing, diet and general hygiene of the population as a whole. During the last hundred years the standard and conditions of living have changed greatly for the better, and the public, as well as the medical profession, have learned to appreciate the fundamental facts of tuberculosis. The decrease in tuberculosis has depended upon the improved conditions of life, the public knowledge of the disease and the facilities provided for treatment on the widest scale. The control of infection through the isolation or successful treatment of a proportion of infective cases, and through the partial eradication of bovine tuberculosis have also undoubtedly had some effect.

In East Africa the population, compared with that of Britain, is poverty stricken. The conditions of life are usually bad. The public knowledge of tuberculosis is negligible, and the facilities provided for treatment are quite inadequate to have any effect in the control of the disease. These facilities usually consist of wards in which tuberculous patients are housed, but the treatment given is, with rare exceptions, unlikely to arrest the disease. The principal exception to this inadequacy is the Government tuberculosis hospital and village settlement at Kibongoto, Tanganyika Territory, where Dr. H. N. DAVIES has for several years successfully practised collapse therapy.

The control of infection through the isolation and treatment of infective cases, therefore, is an inconsiderable matter in East Africa. Fortunately, tuberculosis of cattle, though it does occur in some parts, is not common.

In Britain, the public have confidence in the treatment of tuberculosis. In Africa, though the Natives are quick to acquire confidence in medical measures when they see results, as in the case of the treatment of malaria, they cannot have confidence in a treatment of tuberculosis, which is merely expectant, and is also ineffective. It is necessary to stimulate that confidence by offering active treatment, so that the Natives may be induced to seek it.

It is obvious that to provide tuberculosis hospitals and dispensaries with trained staffs in East Africa on a scale comparable with that of Britain is an enormous undertaking which, though desirable, may never be possible. Even if it were possible it would not be effective to control the disease without the intelligent co-operation of the public. In the meantime tuberculosis is increasing, and it is therefore urgently necessary that steps, other than those which depend on the spending of money on the construction of special hospitals and dispensaries, should be taken to commence the control of the disease. Suggestions for these are here outlined.

Suggestions for a control scheme.

There exists in the colonies an organization through which Natives can be approached. The administrative, educational and medical

authorities may be in fairly close contact with them, and missions maintain intimate touch.

All these departments should be informed of the problem and of the steps proposed for dealing with it. In the colonies, however, the existing figures of the incidence and death rates of tuberculosis, unless specially collected, usually underestimate the position. If more accurate knowledge is desired, special investigations including tuberculin or radiological surveys, such as have already been made in certain parts, may be inaugurated with advantage.

The policy of the tuberculosis department of the County of Lancaster is succinctly outlined by Dr. G. Lissant Cox—" To find, isolate, educate and treat the adult positive case." For the colonies this policy may be amplified. It should be :—

" To find, isolate, educate, treat and provide for the cases of tuberculosis.

" To raise the standard of medical education in the general population.

" To raise the standard of living and housing."

The *finding* of cases of tuberculosis does not consist of the passive method of merely diagnosing those patients who present themselves.

To be done efficiently it entails an active search, especially among those who are most likely to be diseased, namely, the contacts and the people with chest trouble which does not, within a short time, improve. In one colonial town it was found that when Native sanitary inspectors were urged to report and bring to hospital Natives who suffered from chronic cough, the number of cases of tuberculosis diagnosed in one year was almost double that of the preceding year. It therefore becomes the duty of the medical departments *to suspect* and *to seek out* cases of tuberculosis. If a Native sanitary inspector were to visit the home of every case diagnosed, and to collect the contacts for periodical examination as a matter of routine duty, a step forward would be taken. It would be necessary, however, to secure the willing co-operation of the Natives.

Since there is no tuberculosis service in East Africa, it is usually the duty of the medical staff of general hospitals, and of general practitioners, to undertake the diagnosis, the seeking out, the treatment, and the supervision of tuberculous patients and their contacts. Tuberculosis in Britain has become a matter entrusted to a specially trained staff. Such a position does not obtain in any but exceptional places in the colonies, but there is, unfortunately, a strong disposition among colonial medical men to regard themselves as incompetent to give modern treatment to patients with pulmonary tuberculosis, and therefore to take no steps other than to attempt to treat them by rest. For this reason there is little incentive to seek out fresh cases. Contact examination is only rarely undertaken, and the supervision of families, with the object of the prevention of the disease in contacts, is only occasionally applied.

The finding of cases of tuberculosis may be greatly assisted by non-medical bodies and individuals who are in close touch with the Natives. Missionaries are usually most willing to assist in such matters, and employers of labour, schoolmasters and others have often taken the first steps towards diagnosis by urging the Natives to seek medical advice. But without some information, it cannot be expected that these people will be more than occasionally helpful. It is therefore advisable, so far as possible, to give them the little knowledge of

tuberculosis, as well as of other diseases, necessary to enable them to judge when to send a Native for examination. If their judgment errs on the side of over caution, no great harm is done.

The *isolation* of cases of tuberculosis is a most difficult matter. Compulsory isolation in hospital is inadvisable and at present impossible. Even if it were possible, hospitals would soon be known as places from which tuberculous patients never return, and as few Natives wish to spend the remainder of their lives away from their families, the tendency would be to conceal the disease in fear of the isolation.

In any case, the accommodation for isolation on a large scale does not exist, and would be enormously expensive to provide.

Partial isolation, in the bacteriological sense, however, may be possible. Carefully educated sputum positive patients in England can, and do, by following the advice given, avoid causing tuberculous *disease* in their children. They may *infect* them, but infection is a usual occurrence in the white countries (and in the colonies) and need by no means proceed to actual disease.

The efficacy of such isolation in the patients' homes depends on the accommodation in the houses, the intelligence of the patients, and the conviction with which they accept the education given.

It is essential that isolation in this sense should be continuously attempted. It is in the family contacts of cases of tuberculosis, and in the areas of dense population, that the disease is most prevalent, and there is little doubt that massive and continuous exposure to tubercle bacilli is the dominant factor in the spread of tuberculosis. If the disease is to be controlled, and its spread prevented, it seems to be logical that, since the patients must live among the general population, they should be persuaded to cause as little harm as possible. As pointed out above, this matter depends to a great extent on housing conditions, and in this respect the raising of the general standard of living, the supervision of town planning, and the abolition of taxation which penalizes the construction of extra buildings, are important. Village settlements here play a part, but because they are expensive and as yet few in number, their influence is principally that of example.

The *education* of tuberculous persons is of the very greatest importance. If such people are treated unsuccessfully—as is usually the case in many colonies—and are allowed to live with their families and to cause disease in them, the effort is wasted. The only hopeful line of attack in tuberculous people in whom treatment is certain to fail, is to prevent the spread of the disease to others. The necessary isolation in the home cannot be achieved without the understanding of the facts of infection by the patients and the families. Dogmatic and unexplained orders will be disregarded. Such understanding can be created by sympathetic and painstaking explanation. That the advice will not always be understood or acted upon is inevitable, but is not a good argument against giving it. If given carefully, the advice will often carry conviction and be followed, and if it is found that the instruction given is unsuccessful in carrying conviction or obtaining results, the instructors should criticize their methods rather than the educability of the Natives. The first essential is that the Natives should believe what is told them, and when it is realised that this means that their own ideas of disease must be removed and replaced by totally new conceptions, it is clear that quick results cannot be expected, and that long and patient work is necessary. But the

probability that this education may not be accepted by the mass of the people for generations should not prevent its inception. The alternative, of leaving the public in ignorance of the mode of spread of the disease, and the possible means of preventing that spread, is fatal to efforts to control disease (and especially tuberculosis) in the colonies.

It is one of the functions of sanatorium treatment in Britain to educate the patients so that they may continue sanatorium régime in their homes. This should be the routine procedure in all hospitals in Africa.

The *treatment* of Natives suffering from tuberculosis is at present inadequately provided for in East Africa. This is only to be expected in those countries in which general hospitals and doctors are far more scarce than in Britain. The record of the medical departments in the provision of accommodation and staff for general diseases is good, and progress is being continuously maintained. It is not surprising that attention has been particularly directed to the common and more easily curable diseases, and that surgery and tropical diseases have been extensively studied and provided for. Recent reports from the colonies, however, have shown that tuberculosis now claims a place among those conditions which are of urgent importance.

It is interesting to compare tuberculosis with leprosy. Leprosy, largely on account of the fact that it is easily recognized and that its results are visible and terrifying, has acquired a reputation which is well known to Natives, and through biblical literature, to Christians from their childhood. It has caught popular imagination, with the result that the British Empire Leprosy Relief Association exists, and countless settlements for leprosy patients are scattered over the colonies, while some Governments maintain research workers to study the disease. Tuberculosis, more insidious, less obviously harmful, is far more widespread and fatal in the colonies, is increasing, and is an altogether more serious problem. Yet arrangements for dealing with it do not compare in expense or extent with those existing for the control of leprosy.

The treatment of tuberculosis, even in Britain, is often only partly successful, and yet millions of pounds are, rightly, spent on it. The treatment in Natives must necessarily be less successful than in Britain for many years. But it must be given. It is almost useless to preach prevention to Natives unless treatment is given, and the more successful the treatment, in a disease like tuberculosis in which it can never be absolutely successful, the more will the Natives appreciate the importance of prevention.

It is therefore necessary that, as far as possible, the Natives should be able to receive the most efficient treatment known to modern medicine, and since the majority of Natives live too far away from the cities, where alone specialization is generally possible, it is evident that as far as possible, the modern treatment which in Britain is in the hands of specially trained doctors must, in the colonies, be undertaken by general medical practitioners, whether in charge of general hospitals or in private practice.

At little expense, wards for tuberculous patients can be provided, if they do not already exist, in most general hospitals, and the cost of apparatus other than X-ray plants, is not great. In particular, collapse therapy in pulmonary tuberculosis can be much more widely applied than at present.

It is therefore of the utmost importance that all practitioners in the colonies should realize that it is their duty, so far as possible, to give modern treatment to suitable cases, and to attempt the prevention of the spread of the disease. Colonial doctors deal successfully with many conditions which would, in Britain, be referred to specialists, and there is no reason why tuberculosis should not be recognized as one of these. A defeatist attitude is fatal. As a corollary to this argument it is evident that facilities for the instruction of general medical officers and practitioners should be available, and a short course conducted in England by experts interested in and experienced in colonial conditions would be a desirable step in this direction. Such a short course is not yet available, though the longer course started in Cardiff by Professor S. Lyle CUMMINS covers the whole ground.

The alternative is the present position, in which the treatment given is almost useless, and to the patient appears to be negligible. These patients can retain little confidence in their doctors, and it is therefore difficult to induce them to believe in methods of prevention, even in those few places where these are taught.

If the doctors of general hospitals feel themselves to be incompetent in the matter of the treatment of tuberculosis, or do not possess X-ray facilities, it is not inconceivable that periodical visits to their hospitals by specialists in tuberculosis, equipped with portable X-ray apparatus, would solve the problem. The Medical Officers and General Practitioners are undoubtedly capable of continuing pneumothorax refills under the occasional guidance of specialists.

Such specialists could undertake the examination of suspicious persons and contacts, and any epidemiological work required, and could, with the aid of films and demonstrations, give lectures to suitable groups of people.

To maintain the efficiency of treatment, it is necessary that the patients be treated for long periods, and much of this time will necessarily be spent by the patients in their homes. It is therefore desirable that the doctors and specialists be assisted in their work by subordinate staff who will visit the homes and maintain contact between the patients, their families and neighbours, and the medical staff. These persons of the subordinate staff could see to what extent precautions against contact are taken in the patients' homes. The existing staff of sanitary inspectors could undertake much of this work, and in Tanganyika Territory there are some who do so now.

The above remarks refer principally to the treatment of pulmonary tuberculosis. Non-pulmonary tuberculosis is not so serious to the patient or dangerous to others, and on the whole is much more efficiently treated at present than pulmonary disease.

The *provision for* cases of tuberculosis is a matter which is at present attended to in certain colonies to the extent of relieving them of tax payment. It occasionally happens, however, that such patients only attend at hospital when renewal of the exemption certificate is due. They accept no treatment, and are, medically, uncontrolled. Exemption from tax does not remove the necessity for earning a living, and although this is not so great a matter in an agricultural or pastoral area where wives and children can do the necessary work, it is important in other communities.

At present, in Tanganyika Territory, a tax-paying man found to be suffering from tuberculosis is given exemption from tax, and is usually

advised to rest from his work. No such provision is made for a tuberculous woman or for tuberculous children. It is, of course, obvious that infective women who remain at home come into closer contact with their children than do infective men, and women are expected to continue to perform their household work as long as they are able to do so. This work is not heavy, but provides unlimited opportunities for the spread of infection.

If tax exemption, partial if not complete, were allowed to a healthy husband whose wife or child is tuberculous, on the understanding that the medical instructions for the isolation of the patient under home conditions, and for the treatment of the disease, were fully carried out, and if constant supervision of the family were made by a responsible person, and if it were within the power of the Medical or Health Officer to withdraw that exemption if the instructions were not obeyed, a strong stimulus would be given to the healthy man to see that this advantage should not be forfeited. Combined with an appeal to common sense, such a measure might be beneficial.

In Britain, a tuberculous person may receive sickness benefit which allows him the rest necessary for cure, or arrest of disease, and tends to keep his actions controlled by the medical staff. No such provision exists in the colonies.

If it were possible to provide a tuberculosis benefit of money in the colonies it is obvious that the threat of stopping such benefit if medical advice as to treatment and prevention was not followed, could become an instrument of considerable value in the control of tuberculosis.

It is therefore suggested that Governments should examine the possibility of the introduction of sickness benefit for tuberculosis and other chronic disabling diseases. The writer is not competent to judge the feasibility of such a measure, but puts it forward as a suggestion for consideration. The humanitarian aspect of sickness benefit, though not stressed, is a factor.

One of the most important and successful measures of providing for tuberculous persons in England is the village settlement scheme, of which that at Papworth is the most well-known example. There the patients work for wages under protected conditions, and thus regain that self-respect which tends to be lost in the course of chronic disabling diseases. The results of treatment there bear comparison with those of other institutions, and the records of the health of the children of tuberculous parents are impressively good.

Village settlements of this kind have already been instituted by certain progressive colonial Governments, and their example should be followed wherever possible. Apart from the direct benefit to the patients concerned, the educative value of settlements is very great.

The raising of the standard of medical education in the general population.

In Tanganyika Territory it was found, during the investigation of tuberculosis, that only one-third of the pulmonary cases had disease confined to one lung on first examination by X-ray, and that a very much smaller proportion could be regarded as early cases. In this respect the African Natives are worse than the people in Britain, but even in Britain the lesions are too often far advanced on first diagnosis. Many of these African patients were living within easy reach of hospital and X-ray facilities. The delay in most cases was due to the lack of appreciation of the gravity of the early symptoms.

Late diagnosis is, of course, dangerous to the patient in that an advanced lesion is more difficult to treat than an early one, but it is also dangerous to the contacts since no attempt at isolation or the control of infection in the houses is thought of before it is suggested by a medical authority. It is difficult enough for medical men to know when a cough or a feeling of lassitude is a serious matter or not, but in Africa, where pulmonary tuberculosis is usually accompanied by positive sputum, it would be a reasonable measure to *examine the sputum of every patient giving the history of cough persisting for one month*, and, of course, of every patient giving a history of haemoptysis. In this matter, the keeping of adequate case record cards in hospital out-patient departments is most important, since the responsibility for deciding upon sputum examination, when once the patient has presented himself at hospital, rests with the medical staff, who must have records to which they can refer, rather than (as often at present) having to rely on memory. The ordinary out-patient registers are insufficient in this respect. It is also necessary that the staff of trained laboratory assistants should be sufficiently numerous to deal with this work without haste, and should be informed of the errors possible in the examination of considerable numbers of specimens of sputum. These errors may be avoided by destroying all slides on which acid-fast bacilli have been found, by using match sticks for spreading sputum on slides—a new stick for each specimen—and by taking the greatest care that vessels for collecting sputum are thoroughly cleaned before use. If these procedures (or similar ones) are not enforced, acid-fast bacilli will be carried over, on glassware, insufficiently burnt platinum loops, or in sputum cups, from one specimen to another.

But the principal argument of this section is that, as in most cases of all diseases, the responsibility for seeking medical advice first rests either with the patient himself, or with his family, and unless these members of the general population possess some knowledge of the elements of disease, this delay at a period of disease which is critical both for the patient and his contacts, will remain as a great stumbling block in the way of control.

The logical conclusion is that the general population must be instructed in the essentials of tuberculosis, but to confine such medical instructions to one disease would be foolish. They must therefore be instructed in the elements of all communicable diseases, and, to be effective, this instruction should be included as part of the routine education of older school-children. It should be regularly given and should be as uniform in matter and presentation as the conditions of the different parts of East Africa (and possibly of other colonies) will allow. Health education is given at present, but in some cases the text-books used have not been written by medical men, or do not cover the necessary subjects, or are too concerned with physiology. The instruction of the teachers is not often in the hands of the Medical Departments.

It is therefore suggested that a text-book should be compiled by a committee of medical men and education experts, covering the subject of all communicable diseases and including the elements of bacteriology, helminthology and protozoology, with brief details of the mode of spread and outstanding symptoms, suitable for use in East Africa (and possibly other colonies) as a book from which children can be taught and which can be given to them to keep. If the instruction of the teachers should be carried further than this, the

compilation of a more advanced book for them can be considered. These text-books should be translated into the necessary languages, and in this way the essential uniformity of instruction can be ensured.

Medical Departments should keep a close watch over all such medical instruction, and responsible Medical or Health Officers should visit schools, test the efficiency of teachers, and estimate the understanding of the matters taught.

The adult population need not be neglected, and lectures, demonstrations and films may be used to show selected persons the modern approach to medicine. Natives are interested in health and can be impressed, for instance, by being shown motile bacteria under a microscope, provided that the matter is explained to them. But spasmodic instruction is not very valuable. The essence of propaganda is its regularity and its reasonableness. If Missions could combine regular health propaganda as an adjunct to the religious instruction they give, they would influence an enormous population, and the weight of their authority would be of the greatest service. But in that case, the propaganda should be exactly the same as that given in schools.

In all this instruction it must be clearly recognized that the object is to convince the Natives of the truth and usefulness of the matter taught. This will be a long and difficult undertaking in a conservative and incredulous community, but it can be done, though not quickly. The intelligence of senior school-children is perfectly capable of grasping well and directly taught medical subjects, but it is a hard test of intelligence to expect Natives to draw conclusions applicable to every-day disease from instruction in pure physiology.

Instructions given to tuberculous patients who are allowed to live in their homes, which aim at inducing them to prevent the spread of the disease in their contacts, may be expected to carry more weight if they recall the lessons received in childhood than if they are completely new. In England, careful patients can and do prevent such spread.

Possible counter arguments that school-children would become too conscious of disease, or that the little knowledge gained would be the dangerous thing misquoters of Pope claim, cannot be sustained in the absence of experimental proof. The principle of the health education of children is generally accepted, and the present suggestion is concerned with extent and manner of presentation.

A common modern tendency in health instruction is to emphasize the desirability of physical fitness and to urge its maintenance by exercises, diet, and the open air life. This is admirable and justified, but when it is realized that liability to infectious diseases is not correlated so much with general physical fitness or unfitness as with specific immunity to those diseases, and with opportunity for infection, it will be evident that physical instruction is not enough. Under the simple theory of the value of open air exercise there are probably few instructors who would not advise strenuous (and exceedingly harmful) measures to overcome the lassitude which is frequently the first sign of pulmonary tuberculosis.

This education should be supported by laws and good government. For instance, it is useless to preach the value of open windows at night to people who close them for fear of theft or raids, and to urge the value of separate sleeping quarters for members of families if additional buildings are taxed. A hut tax, as Professor Lyle Cummins

has pointed out, encourages overcrowding, as Native huts are often built on a plan which does not admit of division into rooms, so that separate rooms entail separate buildings and therefore increased tax payment. Taxation is fortunately not always on this principle.

Instruction in medical matters should not be confined to schools. It would, of course, as at present, be given in medical schools, to dressers and dispensers, but it should also be given to the adult population. This would probably best be done through hospitals, by providing demonstrations. Thus, influential Natives could be invited periodically to hospitals, where brief and simple lectures could be given. The hospitals could be inspected, and demonstration of patients illustrating the points raised could be made. So far as tuberculosis is concerned, the value of special tuberculosis hospitals and village settlements could be made clear to such visitors.

It is often noticed in Africa that the Natives living near missions tend to imitate mission buildings when constructing new houses. It is therefore probable that Natives who have been for any considerable length of time in a well-built hospital, especially if they have been shown the importance of good housing, will, in due course, make some effort at imitation. This tendency can be enormously assisted by sympathetic advice.

To sum up this matter of the medical education of Natives, it may be stated that the intention should be to convince them that many diseases are caused by infection, that the methods of infection described are correct, and that the steps advised for the avoidance of such diseases are logical and wise. This education will not be universally accepted unless taught to the young, and even then not for many years. That this extent of instruction is not given in Britain is not a good argument for the opinion that it is impracticable in Africa.

It is an argument in this section that a hopeful method of reducing the incidence of tuberculosis is to create a public knowledge of the facts of the disease. Further than knowledge, it is probable that from such knowledge a public opinion may be stimulated, and this may become associated with public good taste, which may be expected to have useful effects. For instance, the dangers of spitting in public buildings and vehicles and in private homes have for long been recognized in England. It is probable that from this realization spitting has come to be regarded as a filthy habit, and it is now a practice which is "not done," and the most probable immediate reason for its rarity is that a person spitting in public would be looked upon as socially undesirable—as an outsider. Native servants accustomed to the cleanliness demanded by British mistresses become clean themselves and dislike, for instance, being forced to live in the dirty quarters sometimes necessary when travelling. They have, in fact, acquired a good taste, the effects of which are medically desirable.

Knowledge of the elements of infectious disease, by appealing to self and family interest, may be expected to create such a good taste even in a Native community. It is not probable that such a feeling can be created without the comprehension of the facts of infection. Dogmatic statements and disciplinary measures are insufficient. Even in highly disciplined totalitarian States, propaganda and explanation are deemed necessary to the unification of political action of the peoples. The authorities of these states entertain no doubts as to the supreme importance of teaching their ideas to children and of giving instruction and propaganda in the most formative and

retentive years. What is found to be valuable in political life, where the instruction given is not always notable for its accuracy or susceptibility for proof, may be expected to be even more valuable in a science in which everyday experience demonstrates the truth of the matter taught.

The importance of example should not be forgotten, and it should be impressed on Europeans and Asiatics in Africa that their habits serve as the models which the Natives tend to imitate. The ignorance too often displayed by Europeans and Asiatics in matters of disease should be dealt with.

The remaining parts of the general scheme stated earlier in this paper are largely self explanatory. Suspicion of cases showing chronic cough, frequent examination of contacts, and the raising of the standard of living and housing are obvious and necessary measures, to be adopted and expanded as occasion allows. It is important to remember that the work of subordinate staff in Native countries can be maintained at a reasonably high level if, among non-medical Natives in positions of authority, there is a public opinion which insists that such subordinate staff should work efficiently. In other words, educated Native chiefs can ensure that Native sanitary inspectors do their work well, so greatly assisting the medical departments. It is therefore advisable to convince the chiefs of the value of such work.

The scheme outlined in this paper is principally a proposal to take active steps towards the prevention of tuberculosis, and entails difficult and painstaking work by medical authorities, and the co-operation of clinicians and education authorities. It does not, however, depend on the expenditure of sums comparable with those spent in Britain, which would be impossible in the colonies.

Though the scheme cannot be regarded as beyond improvement, under the present conditions of colonial tuberculosis, which are recognized as being urgent, it should not be condemned unless another, showing more probability of success, is suggested. The present position with regard to the control of tuberculosis is untenable, and any attempt to eradicate the disease by the mere provision of treatment centres which do not emphasize prevention is impossible financially and unlikely to succeed medically. To the writer there seems to be no alternative other than the proposal here set down in its broad principles, since artificial preventive vaccination is still in the experimental stage.

[An excellent summary of modern opinions regarding the control of tuberculosis in the tropics, with the author's own suggestions, has been published by COCHRANE (see this *Bulletin*, 1937, Vol. 34, p. 819).]

RABIES.

A REVIEW OF RECENT ARTICLES.—XXIX.*

i. *Virus.*

The virus of rabies has been successfully cultivated at Jerusalem by BERNKOPF and KLIGLER.[1] "In our experiments, carried out before the appearance of the preliminary report by WEBSTER and CLOW, we tested a variety of media and finally obtained definite evidence of multiplication in a plasma medium . . . . . Subsequently we also used the method described by these authors." Virus cultures inoculated at 30° or 37°C. increase in virulence up to about the 6th or 7th day. Thereafter the virulence declines and disappears by the 20th day. Formalin (1 : 1,000) inactivates the cultures if kept for one hour at 37°C. and for 48 hours at ice-box temperature. Growth in Webster and Clow's medium was observed when human or monkey serum was an ingredient, but not with rabbit serum.

SCHULTZ and WILLIAMS[2] report that, using the method of WEBSTER and CLOW (this *Bulletin* 1937, Vol. 34, p. 671), they have successfully cultivated the virus of rabies through 16 subcultures. They were unable to propagate the virus on the chorio-allantoic membrane of the chick.

A strain of virus isolated from the vampire bat which has the peculiarity of causing death of rabbits in 2 days is described by PAWAN.[3] The animal experiment was repeated a number of times, and in each case the incubation period was 2 days. Even after the brain had been kept for six months in glycerine-saline in cold storage the virulence was not reduced. As the diagnosis of rabies was in the earlier tests in doubt (absence of definite Negri bodies), the virus was injected into the sciatic nerve of a rabbit. Death took place in 20 days and Negri bodies were found in the hippocampus. This observation was repeated on two occasions with the same result. "The constancy of the symptoms of infection with death, and the ultimate development of Negri bodies by intrasciatic injections, prove that one and the same virus, that of rabies, was responsible for the results, unless one postulates that in the original bat, or the experimental rabbit, there existed, coincidently with the rabies virus, an unknown infection capable of producing paralysis with death in rabbits in two days."

From an extended series of experiments OLÁH[4] finds that fixed virus is less affected between the temperatures of −4°C. and 37°C., and over periods extending from 1 to 77 days, by phenolglycerine than by glycerine alone. Of 209 mice inoculated with the former under various conditions 145 contracted rabies, whilst of 207 inoculated with the latter under similar conditions 74 died. In physiological salt

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* For the twenty-eighth of this Series see this *Bulletin*, 1938, Vol. 35, p. 167.

[1] BERNKOPF (H.) & KLIGLER (I. J.). The Cultivation of Rabies Virus in Tissue Cultures.—*Brit. Jl. Experim. Path.* 1937. Dec. Vol. 18. No. 6. pp. 481–485.

[2] SCHULTZ (E. W.) & WILLIAMS (G. F.). Cultivation of Rabies Virus.—*Proc. Soc. Experim. Biol. & Med.* 1937. Nov. Vol. 37. No. 2. pp. 372–373.

[3] PAWAN (J. L.). An Unusual Strain of Rabies Virus in a Vampire Bat.—*Ann. Trop. Med. & Parasit.* 1938. Apr. 28. Vol. 32. No. 1. pp. 35–38.

[4] OLÁH (G.). Phenol-Kochsalzlösung als Konservierungsmittel des fixen Virus der Wut.—*Ztschr. f. Immunitätsf. u. Experim. Therap.* 1938. May 12. Vol. 93. No. 1. pp. 44–56. [18 refs.]

solution containing 0·5 per cent. phenol the virus survived for a still longer period. Thus in an experiment comparing phenol glycerine salt solution and phenol salt solution as preservatives, in the case of the former 28 out of 57 mice developed rabies, whereas in the case of the latter 41 out of 60 died of rabies.

Dodero[5] states that on two occasions he has observed reactivation of fixed virus by the action of glycerine. This is of interest as the same phenomenon is said to occur with the virus of herpes and Borna disease. The evidence depends upon the result of animal inoculation, and the author admits the possibility either of faulty technique, or that the inoculated animal might have been refractory, but states that both are unlikely.

The character of the Paris strain of fixed virus originally obtained by Pasteur in 1882, which has been passaged from brain to brain for 54 years, are described by Lépine[6]. In June 1936, it was in its 1,558th passage. The author draws attention to the fact that it was purposely selected by Pasteur from a number of strains, because of "its better result in immunizing dogs." Not only does it differ from other strains, but it differs also from strains which have the same parentage, but which for considerable periods of time have been carried on in other laboratories. He points out that the Sassari strain, which is the only fixed virus which kills mice and rats with regularity after subcutaneous inoculation, was originally a Paris strain. It was introduced into Sassari in 1900. The Paris strain has a high antigenic value, and Lépine sees no need, at least for the present, to search for other strains of fixed virus to be employed for antirabic vaccination.

After a preliminary discussion of variation of fixed virus in general, and of the results which have been obtained with the strains in use at various institutes, Virga[7] describes the properties of the Palermo strain. This is in its 2,687th passage. It is inactive when injected subcutaneously, but active (about 50 per cent. infections) when injected intraneurally or intraocularly into the guineapig: about 33 per cent. by scarification, and 37 per cent. when injected into the muscles of the neck. It resists drying for 7 days, glycerine for 2 months. It resists phenol for 11 days. As these results are not in complete accord with those found with other strains, the author advises that strains used for antirabic treatment should be examined from time to time in order to detect any changes which may have occurred.

The characteristics of the fixed virus in use at Eritreo di Asmara are discussed by Chiari[8]. This strain came originally from Paris. It has passed through 272 passages in Asmara; the number of previous passages is not stated. In symptomatology and in incubation it has not altered. It behaves normally when injected subdurally into the eye, intramuscularly or intraperitoneally. It is destroyed in 95 per

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[5] Dodero (J.). Réactivation par séjour en glycérine du virus rabique fixe.—*C. R. Soc. Biol.* 1938. Vol. 128. No. 16. pp. 150–152.

[6] Lépine (Pierre). On the Evolution of Fixed Strains of Rabies Virus.—*Jl. Hygiene.* 1938. Mar. Vol. 38. No. 2. pp. 180–184. [12 refs.]

[7] Virga (Ernesto). Sulla virulenza e sulla resistenza ai vari agenti di attenuazione del virus rabbico fisso.—*Giorn. di Batteriol. e Immunol.* 1938. Jan. Vol. 20. No. 1. pp. 47–63. [30 refs.] English summary (8 lines).

[8] Chiari (Bruno). Il virus fisso dell'Istituto Siero Vaccinogeno Eritreo di Asmara (Ceppo Pasteur).—*Boll. Istituto Sieroterap. Milanese.* 1938. Jan. Vol. 17. No. 1. pp. 47–59. [47 refs.] German summary.

cent. alcohol, but resists the action of ether for 120 hours, and it retains virulence for 106 days in 50 per cent. glycerin.

In a long and comprehensive article Freire Muñoz[9] describes the characteristics of the strain of fixed virus in use in Monte Video, and the results of its utilization in veterinary practice. The strain is in its 1,779th passage. A dose of 0·25 cc. of a 1 in 200,000 suspension killed guineapigs invariably. The virus is found in the peripheral nerves of animals which have died of the disease. From a large series of experiments it appeared that fixed virus could not be demonstrated in the saliva nor in the central nervous system of vaccinated dogs. Statistics regarding treatment of dogs and herbivora follow.

The characters of the strain of fixed virus in use at Boulogne are described by Bertoni[10]. The author discusses in particular its resistance to desiccation. The strain on January 1st, 1937, was in its 3,324th passage.

The characteristics of street virus, as it is found in Tonking, have been studied by Dodero[11]. In all 448 examinations were carried out during the period 1900–1936. The frequency curves of incubation periods in the inoculated rabbit are given, and show that the majority of strains induce rabies between the 12th and the 20th day. After passage through the monkey, the virus is stated to become attenuated.

Mesrobeanu[12] has succeeded in cultivating the Aujeszky virus on the chorio-allantoid membrane of the chick, following the method of Goodpasture and Woodruff. The lesions produced on the membrane are described. A proliferation of ectoderm in the form of cords or epithelial pearls is accompanied by a cellular infiltration of the adjacent mesoderm. The endoderm also proliferates. The proliferation increases forming an inflammatory nodule. At the centre of this nodule both the ectodermic and the mesodermic elements undergo degeneration. The lesions are similar to those which occur in herpetic infection of the neurones. At first the nodules are disseminated, later they coalesce and an ulcer is formed. At the moment the series is in its sixth passage and is being continued.

Two cases of reputed infection of human beings by Aujeszky's virus are described by Tunçman[13]. The first occurred in a laboratory assistant during work with rabbits suffering from the disease. He was wounded on the thumb by a fragment of bone. Two or 3 hours after, an intense pruritus supervened at the seat of the bite, and this extended over the whole body. The pruritus lasted only 6 hours. The second case was similar, the sufferer also being an attendant engaged in much the same duties. The incubation in this case was 18 hours, and pruritus dis-

[9] Freire Muñoz (C.). La acción de la vacuna antirrábica, considerada bajo distintos aspectos, en su aplicación práctica y experimental.—*An. Facultad de Vet.* Montevideo. 1937. Dec. No. 2 & 3. pp. 197–239. With 1 folding chart. [27 refs.]

[10] Bertoni (Georges). Sur la méthode classique de Pasteur pour la vaccination antirabique.—*Ann. Inst. Pasteur.* 1938. Feb. Vol. 60. No. 2. pp. 189–194. [13 refs.]

[11] Dodero (J.). Le virus des rues tonkinois.—*Bull. Soc. Méd.-Chirurg. Indochine.* 1937. Aug.-Sept. Vol. 15. No. 7. pp. 740–748. With 6 graphs.

[12] Mesrobeanu (I.). Culture du virus de la maladie d'Aujeszky dans la membrane chorio-allantoidienne du poulet.—*C. R. Soc. Biol.* 1938. Vol. 127. No. 13. pp. 1183–1185.

[13] Tunçman (Zekai Muammer). La maladie d'Aujeszky observée chez l'homme.—*Ann. Inst. Pasteur.* 1938. Jan. Vol. 60. No. 1. pp. 95–98. With 1 fig.

appeared after 48 hours. Blood serum was drawn off when the pruritus was most intense, and inoculated subdurally into one rabbit, and subcutaneously into a second. After 18 hours both animals showed typical symptoms of Aujeszky's disease. Other rabbits inoculated with blood drawn 8 hours after the accident, were unaffected.

Remlinger and Bailly[14] state that hyperglycaemia occurs in animals affected by pseudo-rabies even as it occurs in rabies. In the former the hyperglycaemia is found to be more intense. Similarly, chlorides in the red blood cells and in the plasma are increased.

Remlinger and Bailly[15] have conducted experiments to find out whether bile has the same destructive action on the virus of Aujeszky's disease as it has on the virus of rabies. They find that one part of bile from oxen, sheep, pigs, dogs and rabbits, neutralizes 5, 10, 20, 50 parts of a 1 in 500 Aujesky virus *in vitro*, and that the time occupied during neutralization at room temperature is 60, 30, 20, 10 minutes and probably less.

As a result of experiments on 5 rabbits, and 9 dogs, Remlinger and Bailly[16] find that unlike the virus of rabies, the virus of Aujeszky is not eliminated by the glands of the gastric and duodenal mucosa.

A very complete and concise summary of present-day knowledge regarding the Aujeszky virus, and its characteristics is given by Bosio[17]. This covers the history of the disease, its geographical distribution, the nature of the virus, mode of transmission, symptomatology, pathological appearances, prognosis, treatment, and immunization. The author, on the evidence of a case quoted from von Ratz (1913), and of the case described above by Tunçman, accepts the view that the disease may be transmissible to man.

ii. *Symptoms and Diagnosis.*

The use of the mouse for diagnosis by the animal test is recommended by Leach[18]. This procedure saves time, and reduces cost. An analysis of 1,032 specimens received from different laboratories and already diagnosed histologically afforded the following results:—

		Negri Bodies		
		+	−	Doubtful
Mouse test	+	335	83	3
	−	3	607	1
		338	690	4

[14] Remlinger (P.) & Bailly (J.). La glycémi et le rapport chloré érythroplasmatique dans la maladie d'Aujeszky.—*C. R. Soc. Biol.* 1938. Vol. 128. No. 16. pp. 178–180.

[15] Remlinger (P.) & Bailly (J.). Action de la bile sur le virus de la maladie d'Aujeszky.—*C. R. Soc. Biol.* 1938. Vol. 127. No. 2. p. 95.

[16] Remlinger (P.) & Bailly (J.). Non élimination du virus d'Aujeszky par la muqueuse gastro-duodénale. Caractère différentiel avec la rage.—*C. R. Soc. Biol.* 1938. Vol. 127. No. 11. pp. 965–966.

[17] Bosio (Giovanni). Il morbo di Aujezsky.—*Nuova Vet.* 1938. Mar. 15. Vol. 16. No. 3. pp. 12–18.

[18] Leach (Charles N.). Comparative Methods of Diagnosis of Rabies in Animals. —*Amer. Jl. Public Health.* 1938. Feb. Vol. 28. No. 2. pp. 162–166.

This discloses an error of 12 per cent. for the brains reported negative for Negri bodies.

A rapid method for demonstrating Negri bodies in sections is described by SCHLEIFSTEIN[19]. Blocks of tissue of not more than 3 mm. in thickness are fixed in Zenker's fluid for 4 hours at 37°C., washed under the tap for 30 minutes, and dehydrated in a stoppered bottle containing dioxan (diethylene oxide) to which a few flakes of iodine, and a substrate of anhydrous calcium chloride have been added, for 1 hour at 37°C. (The tissue should not touch the substrate.) Then transfer to a mixture of equal parts of dioxan and paraffin for 1 hour at 56°C. Paraffin for 1 hour at 56°C., embed. Cut sections of 4μ thickness, and attach to slide by Mayer's albumen fixative. Heat carefully and place in xylol. Remove paraffin in the usual manner and place in distilled water before staining. For staining, two solutions are required.

(1) Rosanilin (Gruebler) ... ... 1·80 gm.
Methylene blue (Nat. col.) ... 1·00 gm.
Glycerol (T.P.) ... ... 100·00 cc.
Methyl alcohol (T.P.) ... ... 100·00 cc.
(After shaking for several minutes this mixture keeps indefinitely.)

(2) 1 in 40,000 aequeous solution of potassium hydroxide. For staining one drop of (1) is added to 2 cc. of (2), and used immediately.

Remove slides from water and place on electric plate, flood with freshly prepared stain, and steam gently for 5 minutes. Cool and wash in tap water. Decolorize in 90 per cent. ethyl alcohol till section assumes a faint violet colour. Pass rapidly through 95 per cent. alcohol, etc. Mount in Canada balsam.

Negri bodies stain deep magenta red, inclusions are dark blue, nucleoli are bluish black, cytoplasm bluish violet and red blood cells copper coloured. The entire procedure occupies approximately 8 hours. " Dioxan is volatile and acts as a cumulative poison, caution must be exercised, and the container must be carefully stoppered. Prolonged exposure to its vapour even in 1 in 1,000 concentration produces severe toxic effects."

iii. *Pathology.*

Experiments have been carried out by REMLINGER and BAILLY[20] on the presence of rabies virus in the gland of Harder. This is a small accessory lachrymal gland. It appears that the proportionate occurrence is of the same order as in the case of spleen, kidney, liver and lung. The authors also examined[21] the glands in cases of Aujeszky's disease and similarly the virus of pseudo-rabies was found in them (7 out of 10 examined).

An extensive research on the titre of rabicidal substances found in the blood of patients treated by various formulae of dried cord

[19] SCHLEIFSTEIN (J.). A Rapid Method for demonstrating Negri Bodies in Tissue Sections.—*Amer. Jl. Public Health.* 1937. Dec. Vol. 27. No. 12. pp. 1283–1285. [17 refs.]

[20] REMLINGER (P.) & BAILLY (J.). Sur la présence du virus rabique dans la glande de Harder.—*C. R. Soc. Biol.* 1938. Vol. 127. No. 5. pp. 387–389.

[21] REMLINGER (P.) & BAILLY (J.). Sur la présence du virus d'Aujeszky dans la glande de Harder.—*C. R. Soc. Biol.* 1938. Vol. 127. No. 8. pp. 657–658.

treatment has been carried out by DODERO[22]. The highest titres were found when formulae which included cords which had been only slightly dried (0, 1 and 2 days) were employed. He also found that when 3 parts of the serum neutralized 1 part of fixed virus, inoculated rabbits were not invariably protected, but when the titre was 5 to 1 there was evidence of better protection.

iv. *Methods of Treatment and Statistics.*

As promised, WEBSTER[23] now presents results regarding the efficacy of tissue culture virus as a vaccine (this *Bulletin* 1938, Vol. 35, p. 168, and 1937, Vol. 34, p. 671). "One-quarter cc. of the undiluted culture, equal to 80,000 intracerebral lethal doses [mice] was harmless when injected intraperitoneally and protected them [mice] in 14 days against a test intracerebral injection of 1,000 lethal doses of mouse brain virus. One-tenth of this amount of culture vaccine was likewise effective but 1/100, containing only 800 lethal doses, was insufficient for immunization. Immunity, when produced, endured at least 9 months and was accompanied by protective antibodies."

Attempts were then made to immunize beagle puppies. For them the minimum lethal dose of mouse-brain virus was found to be 1 cc. of 1 in 1,000 dilution. "Dogs were vaccinated with relatively small amounts of culture virus, 5,000 to 20,000 mouse lethal doses, barely 20 times that required to immunize mice. The vaccine has proved harmless to all 45 dogs thus far treated and has immunized them as follows. In the first test, 7 of 7 vaccinated dogs resisted 1 lethal dose of test skunk virus given 3 weeks later. In the second test, 4 of 4 vaccinated dogs resisted 1 lethal dose and 1 of 3, 10 lethal doses. In the third test, 3 of 3 vaccinated dogs resisted 1 lethal dose, and 2 of 3, 10 lethal doses. In all, 14 vaccinated dogs all resisted 1 lethal dose fatal to 9 of 11 controls. This difference is statistically significant. Likewise, 3 of 6 vaccinated dogs resisted 10 lethal doses fatal to all 5 tested controls. This difference, however, is not significant. The 15,000 mouse lethal doses of culture vaccine which immunized dogs against 1 test lethal brain dose can be contained in 1 cc. and can be increased apparently without harm to 1,000,000 mouse lethal doses. With a larger amount of mouse lethal doses in the vaccine, a greater resistance is expected.

"This evidence that dogs can be successfully immunized with a single injection of culture virus concludes our present report. Further experiments aimed at reducing still further the virulence of culture vaccine without destroying its immunizing potency are now in progress and will be submitted in the near future."

Further study of the effects of phenol on fixed virus have been made by LÉPINE and SAUTTER[24]. It will be remembered (this *Bulletin* 1938, Vol. 35, p. 173) that in spite of the fact that their results showed no significant difference in the immunizing properties of phenol

[22] DODERO (J.). Recherche des substances rabicides chez les mordus traités.—*Bull. Soc. Méd.-Chirurg. Indochine.* 1937. Aug.-Sept. Vol. 15. No. 7. pp. 748–764. With 1 folding chart.

[23] WEBSTER (Leslie T.). Experiments on Antirabic Vaccination with Tissue Culture Virus.—*Amer. Jl. Public Health.* 1938. Jan. Vol. 28. No. 1. pp. 44–46.

[24] LÉPINE (P.) & SAUTTER (V.). Etat du virus fixe dans les vaccins antirabiques phéniqués.—*C. R. Soc. Biol.* 1938. Vol. 127. No. 3. pp. 192–194. With 1 fig.

vaccines heated at 37°C. for 24 hours, and those kept at 20°C. and because no accidents occurred amongst a number of animals so small that in the opinion of the authors they were insufficient for absolute conclusions to be drawn, they concluded provisionally that it was advisable to use a vaccine kept at 20°C. in preference to one at 37°C. for 24 hours. They now point out that all emulsions containing 1 per cent. phenol and kept for 24 hours at 22°C. retain their activity up to 6 months. The vaccine is in their opinion still living, though it is stated to be "practically inoffensive." "The addition of phenol to a virulent emulsion is simply one way of ensuring a certain and progressive attenuation of the virus." [It would appear that the authors are now in a position to withdraw the conclusion of their previous paper, and that they, like the Indian workers, in order to avoid risk, would recommend heating of the vaccine for 24 hours at 37°C. before use.]

In a paper dealing with the statistics of rabies in Tonking, DODERO[25] reports some interesting facts. From the following figures,

	Percentage Mortality during		
	1st month	2nd month	3rd month
Face—			
Treated	93	7	0
Untreated	57	43	0
Upper limb—			
Treated	55	40	5
Untreated	50	37·5	12·5
Lower Limb—			
Treated	36	43	21
Untreated	11	64·5	23·5

he concludes that the effect of treatment is to shorten the incubation period. [The actual numbers on which the percentages are based are given (see below) for the untreated, but unfortunately are not given for the treated.] The mean incubations in days of persons bitten on the various localities according to age groups are as follows :—

	Face	Upper limb	Lower limb
Adults	20	29½	50½
Infants	20½	32	41½

Those for the two sexes were found to be :—

	Face	Upper limb	Lower limb
Males	22	34	50
Females	22	28	55

[25] DODERO (J.). Durée d'incubation de la rage chez les Tonkinois.—*Bull. Soc. Méd.-Chirurg. Indochine.* 1937. Aug.-Sept. Vol. 15. No. 7. pp. 764–776. With 1 chart.

A table which may be useful for reference gives the incubation periods of 40 untreated persons :—

Incubation in days.

	16–20	21–30	31–40	41–50	51–60	61–90	Total
Face	4	0	2	1	0	0	7
Upper limb ...	3	5	4	2	0	2	16
Lower limb ...	0	2	4	2	5	4	17

(Unfortunately, as above stated, a similar table for the treated is not given.)

Jacotot[26] reports incubations of 4, 5, 6 and 7 months amongst guineapigs which had been subjected to a test dose of street virus after preliminary antirabic treatment. The periods for untreated control animals varied from 11 to 30 days.

Four consecutive passive protection tests against street virus in white mice are reported by Hoyt and Gurley[27]. (See also this *Bulletin*, 1936, Vol. 33, p. 323.) The tests included a total of 60 treated and 70 control mice. Of the untreated all developed rabies and died, the mean incubation period being 10·6 days. Of the treated 43 per cent. were alive at the end of 3 weeks. The antiserum used was from rabbits and goats.

In a second communication[28] they report a further test which may be summarized as follows :—

Serum given	Total No. of mice	Survivals	Percentage survivals	Mean incubation in days
1 day before virus ...	21	21	100	—
2 hours after virus ...	19	19	100	—
1 day „ „ ...	18	16	89	25·3
2 days „ „ ...	21	19	90	26·0
4 „ „ „ ...	20	11	55	23·6
Controls, no serum ...	31	3	10	15·3

In this case rabbit serum was used, and in all the tests the protecting dose was administered intraperitoneally, and the test dose intracerebrally.

[26] Jacotot (H.). Quelques cas remarquables de prolongation de la période d'incubation chez des cobayes inoculés de rage des rues après vaccination.—*C. R. Soc. Biol.* 1937. Vol. 126. No. 32. pp. 849–851.

[27] Hoyt (Anson) & Gurley (M. Katherine). Experimental Street-Virus Rabies in White Mice. Studies on Passive Immunization. I.—*Proc. Soc. Experim. Biol. & Med.* 1937. Dec. Vol. 37. No. 3. pp. 454–455.

[28] Hoyt (Anson) & Gurley (M. Katherine). Experimental Street Virus Rabies in White Mice. Studies on Passive Immunization. II.—*Proc. Soc. Experim. Biol. & Med.* 1938. Feb. Vol. 38. No. 1. pp. 40–42.

The statistical material collected by the Health Section of the League of Nations and analysed by McKENDRICK[29] continues to accumulate, and it may now be said that one of the most important problems discussed at the Paris Conference has been answered. The essence of the Pasteurian method of treating rabies lies in the preparation of a standardized strain of virus, attenuated in the sense that it has lost virulence as a subcutaneous inoculum (fixed virus). Variations of the form in which the virus is administered for purposes of treatment, have apparently little effect upon its immunizing properties, but they affect very sensibly the risk which the patient runs as the result of that treatment. There is as yet no definite evidence that when suitable doses are employed, a living vaccine is more effective than a dead one, whilst there is unassailable evidence that the risk run from treatment by the former is much greater than from treatment by the latter.

The evidence upon which these conclusions are based rests upon the data given in the following tables :—

	Number treated	Deaths observed	Calculated*	Mortality %
Europeans:				
1. Cords	53,773	77	82	0·14
2. Dilutions	61,080	108	93	0·18
3. Killed phenol ...	55,644	82	84	0·15
4. Live phenol	3,464	6	5	0·17
5. Fermi's Vaccine ...	6,500	13	10	0·20
6. Fermi's Serovaccine	390	0	0·6	0
7. Heated	93,145	154	141	0·17
8. Killed Ether ...	63,444	79	96	0·12
9. Mixed (*a*) †	49,656	60	75	0·12
10. ,, (*b*) ‡	2,671	7	4	0·26
11. Yatren Vaccine ...	5,384	13	8	0·24
	395,151	599	598·6	0·15
Non-Europeans:				
1. Cords	56,044	341	351	0·61
2. Dilutions	1,777	16	11	0·90
3. Killed phenol ...	280,696	1,761	1,756	0·63
	338,517	2,118	2,118	0·63

* Calculated from the mortality of the 11 groups.

† Mixed (*a*) = dilutions plus, in severe cases Alivisatos.

‡ Mixed (*b*) = dried cords plus in severe cases Fermi's original vaccine.

The agreement between the calculated and the observed deaths is very close—differences as great or greater than those found between the different methods of treatment would be expected to occur amongst samples of an admittedly homogeneous population once in eight times in the case of Europeans, and once in three in the case of the non-Europeans.

[29] McKENDRICK (A. G.). An Eighth Analytical Review of Reports from Pasteur Institutes on the Results of Anti-Rabies Treatment.—*Bull. Health Organisation* (League of Nations). 1938. Feb. Vol. 7. No. 1. pp. 1–42.

As regards accidents following treatment the state of affairs is very different, as is shown in the following tables :—

	Number treated	Accidents		Percentages		
		Total	Fatal	Total	Fatal	Non-Fatal
1. Cords	114,240	31	3	0·027	0·002	0·025
2. Dilutions	62,857	24	17	0·038	0·027	0·011
3. Killed Phenol	353,737	35	11	0·010	0·003	0·007
4. Live Phenol	3,464	0	0	—	—	—
5. Fermi's Vaccine ...	7,319	3	2	0·041	0·027	0·014
6. Fermi's Serovaccine ...	390	0	0	—	—	—
7. Heated	93,145	8	2	0·009	0·003	0·006
8. Killed Ether	63,444	8	3	0·013	0·005	0·008
9. Mixed (*a*)	49,656	26	3	0·052	0·006	0·046
10. Mixed (*b*)	2,671	1	0	0·037	0	0·037
11. Yatren Vaccine ...	5,384	3	0	0·056	0	0·056
	756,307	139	41	0·018	0·005	0·013

The probability that differences in total mortality as great or greater than those observed would occur amongst samples from a homogeneous population is in this case less than one in a million. These results may be roughly summarized as follows :—

	Total Accidents	Fatal Accidents	Non-fatal Accidents
1. Cords	High	Low	High
2. Dilutions	High	High	Low
3. Killed Phenol	Low	Low	Low
5. Fermi's Vaccine	High	High	Average
7. Heated	Low	Low	Low
8. Killed ether	Low	Average	Low
9. Mixed (*a*)	High	Average	High
10. Mixed (*b*)	High	Low	High
11. Yatren Vaccine	High	Low	High

To press the matter home the author gives still another table :—

	Number Treated	Accidents		Fatal Accidents	Percentages		
		Observed	Calculated		Total	Fatal	Non-fatal
1. Killed Vaccines	417,181	43	77	14	0·010	0·003	0·007
2. Live Vaccines	232,888	82	43	23	0·035	0·010	0·025
3. Heated Vaccines	93,145	8	17	2	0·009	0·003	0·006
4. Other	13,093	6	2	2	0·046	0·015	0·031
	756,307	139	139	41	0·018	0·005	0·013

Thus in selecting a method of treatment, so long as the Pasteurian method of administering doses of a fixed strain of virus is adhered to, one need not concern oneself about the immunizing properties of the particular method adopted, but only with the risks to which the patient is subjected—these in the case of live vaccines are about 3 to 4 times as great as in the case of killed vaccines.

In the report for 1936 from Palestine,[30] it is stated that " since 1923 the antirabic vaccine manufactured at the Department's Central Institute at Jerusalem has been a modification of Semple's carbolized killed virus. The success attendant upon its use has justified its continued preparation, and the need for alteration to any other form of Pasteurian treatment has never arisen." A policy of decentralization has been actively pursued, and now treatment is administered at 38 outstations. In all 1,350 bitten persons have been fully treated, and of these one has developed rabies. The percentage mortality is 0·07 as compared with 0·13 in 1933, 0·48 in 1934, and 0·08 in 1935. A case of hydrophobia in an untreated person is reported, its special interest being that the incubation period (face) was only 13 days. No complications or sequelae of treatment occurred during the year under review.

A report of the results of antirabic treatment at Shillong (India) for the year 1936, is presented by Anderson[31]. Thirteen deaths are reported amongst 1,825 persons treated during the year (0·71 per cent.), as compared with 11 out of 1,554 (0·70 per cent.) in the previous year. The vaccine was prepared from Paris fixed virus in 1936, and from Kasauli fixed virus in 1935. The author had hoped on the basis of animal tests that the Paris strain would have yielded better results. One case of post-treatment accident occurred. The symptoms were those of a diffuse myelitis, the condition of the patient after 13 months was " considered stationary and no further improvement to be expected."

A statistical discussion of protection against rabies in Italy is presented by Petragnani[32]. It appears that the number of persons treated in that country is steadily and rapidly declining. The author argues, though on very slender evidence, in favour of treatment by phenol vaccines.

v. *Rabies in Animals.*

An epidemic of rabies in the estate of Tachira (Venezuela) during the period 26th April to 31st July, 1937, is reported by González[33]. Six fatal cases are described, and a short résumé of the general characteristics of the disease is given.

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[30] Palestine. Department of Health. Annual Report for the Year 1936. [Rabies pp. 82–85.]

[31] Shillong: King Edward VII Memorial Pasteur Institute and Medical Research Institute. Twentieth Annual Report for the Year ending 31st December 1936 [Anderson (L. A. P.), Director]. [Rabies pp. 1–4; 15–34.]

[32] Petragnani. Protection contre la rage en Italie.—*Bull. Office Internat. d'Hyg. Publique.* 1938. Mar. Vol. 30. No. 3. pp. 568–576. With 5 graphs.

[33] González (Alfredo J.). Anotaciones sobre un brote epidémico de rabia o hidrofobia en el Estado Táchira.—*Bol. Ministerio de Sanidad y Asistencia Social.* Caracas. 1937. Oct.–Nov. 2nd Year. Vol. 1. Nos. 17 & 18. pp. 1144–1153.

A report of how an outbreak of rabies was stamped out is furnished by HOBDAY[34]. This occurred in the north-west of the Bechuana Protectorate. The methods employed were drastic : an order was issued to destroy all dogs within a radius of five miles of an outbreak : a dog-free belt was created. These measures, " which in the end proved tantamount to a total destruction of dogs over a large area," succeeded in controlling what threatened to be a very serious outbreak and preventing further spread.

The veterinary aspects of the possibility of the control of rabies in India are discussed by WILLIAMSON[35]. This is a carefully reasoned article and covers a wide field. The problem of rabies control, as it applies to India, is beset with difficulties mainly of religious origin, but that much can still be done is well brought out by the author.

JACOTOT and LE ROUX[36] have succeeded in infecting three peacocks by intracerebral injection of street virus. The symptoms were mainly those of paralysis, but periods of hyperexcitability were also observed. Similar results were obtained in the case of pheasants[37].

Two cases of the successful inoculation of rabies into squirrels are reported by PRITCHETT[38] from North Carolina, U.S.A. In both the diagnosis was confirmed by laboratory tests.

Two cases of rabies in horses are reported by SETHI[39]. One of these had been given a 14 day course of Semple's vaccine, 50 cc. being given daily.

Of 1,100 dogs which have been inoculated intracerebrally with street or fixed virus REMLINGER and BAILLY[40] have observed only 4 cases which were refractory to rabies. Such refractory animals are very rare. Possible explanations of the nature of this immunity are considered.

The effects of prophylactic antirabic vaccination of dogs in general is discussed by DE CAMP[41], and in particular, statistics of the results obtained in Detroit (U.S.A.) are given. Of 28,000 vaccinated dogs 10 contracted the disease whilst of a population of unvaccinated dogs estimated at 98,239, 441 became infected. The death rates were thus 0·036 per cent., and 0·45 respectively. " From these figures it may be concluded that an unvaccinated animal is 12·5 times more likely to contract rabies than a vaccinated animal."

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[34] HOBDAY (J.). Rabies.—*Bechuanaland Protectorate Ann. Med. & San. Rep. for Year 1936.* Appendix " E." pp. 44–45.

[35] WILLIAMSON (G.). Aspects of Anti-Rabic Vaccination of Dogs.—*Jl. Roy. Army Vet. Corps.* 1938. May. Vol. 9. No. 3. pp. 117–129.

[36] JACOTOT (H.) & LE ROUX (G.). Transmission de la rage au paon (*Pavo muticus* L.).—*C. R. Soc. Biol.* 1938. Vol. 127. No. 1. pp. 18–19.

[37] JACOTOT (H.). Transmission de la rage au faisan (*Diardigallus Diardi* B.P.). —*C. R. Soc. Biol.* 1938. Vol. 127. No. 2. pp. 131–132.

[38] PRITCHETT (H. D.). Rabies in Two Gray Squirrels.—*Jl. Amer. Vet. Med. Assoc.* 1938. Apr. Vol. 92. No. 4. pp. 563–564.

[39] SETHI (R. K.). Rabies in Horses.—*Jl. Roy. Army Vet. Corps.* 1938. Feb. Vol. 9. No. 2. pp. 90–91.

[40] REMLINGER (P.) & BAILLY (J.). Les chiens naturellement réfractaires à la rage.—*Ann. Inst. Pasteur.* 1938. Feb. Vol. 60. No. 2. pp. 195–200.

[41] DE CAMP (C. E.). The Prophylactic Vaccination of Dogs against Rabies in a Public Health Program.—*Jl. Amer. Vet. Med. Assoc.* 1937. Nov. Vol. 91. No. 5. pp. 581–587. [15 refs.]

vi. *Post-Vaccinal Paralysis.*

Remlinger[42] discusses the statistics of fatal and non-fatal paralytic accidents given by McKendrick in his 7th review of reports from Pasteur Institutes collected by the Health Section of the League of Nations (this *Bulletin* 1937, Vol. 34, p. 676), and lays stress on the fact that the proportion of accidents is high and usually fatal (75 per cent.) after treatment by the dilution method. The reason for this he describes as follows. " Under the influence of passage from rabbit to rabbit the number of germs contained in the fixed virus progressively increases. Consequently—dilution being a method not of attenuation but of repartition—the virus becomes less sensitive to this dilution. Treatment, in place of commencing with emulsions of limited virulence, is thus commenced with products which are frankly virulent, and this is followed by products of still higher virulence." He suggests that in institutes where Högyes' method is employed, new formulae should be instituted based upon experimental evidence regarding the effect of dilution upon the virus in question.

In a second paper this thesis is followed in greater detail, and is further elaborated. Remlinger[43] lays stress on the fact that accidents are four times as frequent with living vaccines as with dead vaccines. " This proportion of 4 to 1 must be taken into serious consideration."

The histological appearances in three cases of paralytic accident are described by Marinesco and Draganesco.[44] A discussion of the aetiology of these accidents follows (in which the reviewer is quoted as favouring an anaphylactic origin, a view which Harvey and he put forward as a mere suggestion some 30 years ago).

vii. *Miscellaneous.*

The effect of antirabic treatment upon the course of nervous leprosy has been examined by Tisseuil and Guilhaumou[45]. As a result of 3 tests, they conclude that whilst temporary amelioration of general condition, fading of leprous nodules, and cicatrization of some ulcers have been observed, the effects are merely those of a simple bio-therapy.

Amato[46] reports that from controlled experiments he finds that fixed virus is destroyed *in vitro* by ascorbic acid. *A. G. McKendrick.*

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[42] Remlinger (P.). Les accidents paralytiques du traitement antirabique par la méthode d'Högyès et leur cause.—*Bull. Office Internat. d'Hyg. Publique.* 1937. Nov. Vol. 29. No. 11. pp. 2354–2358.

[43] Remlinger (P.). Deux cent deux accidents paralytiques du traitement antirabique.—*Bull. Acad. Méd.* 1937. Dec. 7. 101st Year. 3rd Ser. Vol. 118. No. 37. pp. 419–432. [2 refs.]

[44] Marinesco (G.) & Draganesco (State). Contribution à l'étude des accidents post-vaccino-rabiques (à l'occasion d'un cas avec examen anatomo-clinique). —*Ann. Inst. Pasteur.* 1938. May. Vol. 60. No. 5. pp. 477–498. With 11 figs. [21 refs.]

[45] Tisseuil (J.) & Guilhaumou (F.). Essai de traitement de la lèpre nerveuse par le vaccin antirabique.—*Bull. Soc. Path. Exot.* 1937. Nov. 10. Vol. 30. No. 9. pp. 751–755.

[46] Amato (G.). Azione dell'acido ascorbico sul virus fisso della rabbia e sulla tossina tetanica.—*Giorn. di Batteriol. e Immunol.* 1937. Dec. Vol. 19. No. 6. pp. 843–849. [19 refs.] English summary (6 lines).

MALARIA.

Overbeek (J. G.) & Stoker (W. J.). **Malaria in the Netherlands Indies and its Control.**—*Jl. Malaya Branch Brit. Med. Assoc.* 1938. Mar. Vol. 1. No. 4. pp. 281–304. With 21 figs. (2 maps).

This paper contains no original observations. It is an interesting and informative account of the importance of malaria in the Netherlands East Indies and its epidemiology. Reference is made to many of the numerous important contributions to malariology that have emanated from Java. The story of the progress realized in the control of the disease, especially along the lines of species sanitation, is well re-told. A list of the anophelines found in the Netherlands East Indies is given, together with notes concerning the biology, geographical distribution and pathogenicity of those species that are of chief importance as vectors of malaria. Photographic illustrations add to the interest of the paper. *Norman White.*

Mazza (Salvador), Basso (Germinal) & Cardozo (Arturo). Investigaciones sobre paludismo en las provincias Andinas. I. Comprobación de paludismo autóctono en el Dep. Rivadavia, Provincia de Mendoza. [**Indigenous Malaria in Rivadavia Department, Mendoza Province, Argentine.**]—*Universidad Buenos Aires: Misión de Estudios de Patología Regional Argentina Jujuy.* 1938. Publicación No. 35. pp. 3–15. With 8 figs.

—— & Basualdo (Carlos). II. Caso autóctono de paludismo comprobado en el Dep. Albardón, Prov. San Juan. Presencia de *Anopheles pseudopunctipennis* en la región. [**Case of Malaria in Albardon Department, San Juan Province, Argentine : *A. pseudopunctipennis* found in the Neighbourhood.**]—*Ibid.* pp. 17–20. With 1 fig.

Both these reports deal with the occurrence of a case, or cases, of malaria in districts in which that disease has been either absent or extremely rare. Two children in Rivadavia suffered from *vivax* infections acquired locally : no anophelines were found. The nearest possible breeding place for anophelines was four kilometres distant. The case in Albardon was also a *vivax* infection. Prolonged search failed to reveal any other infected persons. In a house adjoining that of the patient several *A. pseudopunctipennis* were found, one of which harboured sporozoites. *N. W.*

Sivalingam (V.). Observations on the Malaria Epidemic in Watawala District during the Ceylon Malaria Epidemic 1934–35 and its after History.—Reprinted from *Jl. Ceylon Branch Brit. Med. Assoc.* 1938. Vol. 35. No. 1. 26 pp. With 2 maps & 11 charts. [10 refs.]

Murray (David R. P.). **Problems concerning the Efficiency of Oils as Mosquito Larvicides. Part I. The Stability of Oil Films on the Surface of Water.**—*Bull. Entom. Res.* 1938. Mar. Vol. 29. Pt. 1. pp. 11–35. With 4 figs.

" Films of oil which have originally covered the whole of the surface of an area of water frequently break up and leave the oil only in patches, and the rest of the surface uncovered. An investigation has revealed that this may be the result of either or both of two circumstances.

" It has been shown that instability may result from :—

" I. Certain relationships between the volatility of the aromatic and aliphatic hydrocarbons composing the oil mixture.

" II. The presence of certain polar substances dissolved in the oil.

" I. The volatility relationships which determine the stability or instability are as follows :—

" (*a*) If the aromatic hydrocarbons are more volatile than the aliphatic, a tendency exists for the oil to become concentrated into one central thick lens with the rest of the surface uncovered by oil.

" (*b*) If the whole of the aromatics are more volatile than the whole of the aliphatics, this action is very rapid and occurs whatever the proportion of the mixture.

" (*c*) If the difference in the volatility is only small, the phenomenon is only observed when the proportion of aromatics to aliphatics is very near to unity.

" (*d*) If the boiling range of the aromatics overlaps the boiling range of the aliphatics (as occurs when two oils containing both types of constituents are mixed), the phenomenon is much less clearly defined.

" (*e*) Olefinic oils, *e.g.*, oils obtained by cracking, behave like aliphatic oils in so far as this behaviour is concerned.

" It is believed that these changes would not occur if the oil was extremely pure, since lenses are only stable if subject to lateral pressure from an invisible film of contaminating material.

" II. The effect of polar materials can be summarised :—

" (*a*) Solutions of certain organic substances in oil tend to make unstable films on the surface of water ; rupture of such a film (by wind or other agitation) allows a unimolecular film of the added substance to spread at the air-water interface. This forces back the oil film. The greater the agitation the less the area of surface eventually covered by oil. In this class of substances are fats, fatty acids, naphthenic acid (a natural constituent of petroleum), some sulphonic acids and cholesterol.

" (*b*) Certain other substances act in a contrary manner. They do not promote instability but actually counteract and, if present in sufficient proportion, overcome the instability produced by the first type of substance. The substances falling in this group are all at present of unknown composition, but include ' cracked spirit gum ' (a material derived by polymerisation of olefinic hydro-carbons), certain resins, and some substance present in petroleum and remaining in the residue after distillation. The last of these acts as a natural ' stabiliser ' and masks the instability phenomenon to some extent in commercial oils. It is found in largest quantity in the undistilled residue of aromatic concentrates.

" (*c*) The quantitative relationship between the ' stabiliser ' and the substances promoting instability is not linear. Successive increments of ' stabiliser ' equalise larger and larger amounts of the other.

" (*d*) Long-chain molecules such as fatty acids are the most difficult to overcome by ' stabiliser.' Naphthenic acid is more easily counteracted, cholesterol still more easily.

"The following recommendations can therefore be made as to the desirable composition of anti-malarial mixtures, so far as film stability is concerned :—

"1. The oil should contain either a small aromatic content or a very high one ; it should not contain 50 per cent. aromatics unless they are very high-boiling (*e.g.*, of lubricating base fraction).

"2. It should consist of a mixture of wide and overlapping cuts of oil.

"3. It should not contain fats or fatty acids added as spread-aiders. If spread-aiders are desired, resins should be employed."

Bessler (C.). Sulla protezione meccanica antianofelica con particolare riguardo ai vari tipi di retine metalliche. Contributo sperimentale. [**Experimental Study of Different Types of Metal Gauze as a Protection from Anophelines.**]—*Riv. di Malariologia.* Sez. I. 1938. Vol. 17. No. 1. pp. 51–61. French summary.

Over a period of seven years a comparison was made of 19 varieties of metallic gauze, as a mechanical protection from anophelines in a malarious region, with special regard to efficacy, durability and cost. Best results were obtained with gauzes of steel, aluminium, bronze, "Monel" metal and galvanized iron. The cost of steel, "Monel" and aluminium gauzes limits their applicability. Gauzes made of phospho-bronze, brass and copper call for consideration of details such as the thickness of the wire and the freedom of the metal from impurities. With the exception of galvanized iron all the gauzes were satisfactory from the point of view of durability, even in coastal regions. *N. W.*

Tillema (S.). De verspreiding van malaria door gezonde parasietendragers. [**Spread of Malaria by Healthy Parasite Carriers.**]—*Geneesk. Tijdschr. v. Nederl.-Indië.* 1938. Mar. 29. Vol. 78. No. 13. pp. 741–750.

Giordano (Francesco). La dilatazione cardiaca nel cuore da malaria. Osservazioni cliniche e radiologiche su 824 militari ed operai rimpatrianti per malattia dall' A.O.I. (II nota sul cuore da malaria.) [**Dilatation of the Heart in Malaria. Clinical and Radiological Observations on 824 Soldiers and Workmen repatriated on Account of Sickness from Italian East Africa.**]—*Giorn. Ital. di. Clin. Trop.* 1938. Mar. 31. Vol. 2. N.S. No. 3. pp. 68, 71–4. [32 refs.]

Among the 824 patients that were observed 415 were suffering from malaria and 60 of these suffered from some form of cardiac disturbance. The author concludes that malaria, like many infectious and other tropical parasitic diseases, is capable of producing, with noteworthy frequency, toxic and circulatory changes in the myocardium. Of the symptoms produced by this myocardial involvement those of acute cardiac dilatation are the most important. *N. W.*

Brachtel (Rudolf A.). Malariafälle mit auffallend langer Latenzzeit. [**Malaria Cases with Remarkably Long Latent Periods.**]—*Deut. Med. Woch.* 1938. May 27. Vol. 64. No. 22. pp. 787–788.

Although in Bohemia indigenous malaria is practically absent, a few sporadic cases occur in travellers from the Balkans or other

parts of the State where malaria is still prevalent. The common causes of relapse were absent in the cases recorded as these occurred in hot summer weather, and quinine prophylaxis could be definitely excluded. The symptoms were often atypical but the diagnosis of malaria was established by the finding of B.T. rings in all except one case. The latency periods varied from 7 months to 1 year and in one patient symptoms disappeared following malaria treatment although he had not been exposed to infection for 7 years. Herpes labialis often described in such cases was absent. A case of malarial attacks 1 year after quinine prophylaxis is also recorded. The object of the note is to draw attention to the possibility of malaria in atypical febrile attacks. *J. D. Fulton.*

Houssiau. Polynévrites d'origine palustre. [**Malarial Polyneurites.**]—*Bruxelles-Méd.* 1938. Apr. 10. Vol. 18. No. 23. pp. 766–767.

A sailor aged 35, who had suffered for many years from occasional attacks of malaria, complained of tingling at the extremities of the three radial digits of the right hand, pressure on which caused acute pain—a case of neuritis of the nerve endings of the right radial nerve. An attack of *falciparum* malaria followed. Quinine was given and the pains disappeared in three days. There was no evidence of alcoholism, lead poisoning or other cause than malaria of polyneuritis. *N. W.*

Junior (Peregrino) & Brandão (Pedro Paulo). Insufficiencia suprarenal no impaludismo. Commentarios acerca de 10 casos clinicos. [**Suprarenal Insufficiency in Malaria.**]—*Brasil-Medico.* 1937. Oct. 16. Vol. 51. No. 42. pp. 1047–1058. With 2 figs. [47 refs.]

This paper deals at some length with the literature of the involvement of the suprarenals in malaria infections and describes ten cases in which signs and symptoms appear to afford definite indications of such involvement. Symptoms of malaria which appear to indicate some pathological change in the suprarenals are asthenia, arterial hypotension, muscular pain, and digestive disturbance, symptoms which are all prominent in Addison's Disease. One of the authors' patients displayed the bronze pigmentation of the skin and mucosa, characteristic of Addison's Disease, which, according to them, is rare in cases of malarial affections of the suprarenals. The prognosis, given adequate malarial treatment, is much better than in cases of suprarenal insufficiency due to causes other than malaria. *N. W.*

Hill (Roy A.). **The Use of Drugs in the Treatment of** [*sic*] **Prophylaxis of Malaria.**—Reprinted from *Jl. Med. Assoc. Georgia.* 1937. Oct. Vol. 26. No. 10. pp. 512–517. [18 refs.]

This paper, read before a medical association, discusses the advantages and disadvantages of quinine and atebrin, respectively, in the treatment and prophylaxis of malaria. The author considers that atebrin is the first drug that we have known that could possibly be used effectively in mass treatment and prophylaxis. A curative dose of atebrin can be given without interference with working efficiency. In the discussion of the paper, Dr. A. R. Freeman agreed with the author regarding the low toxicity of atebrin : he had given

full doses to more than 1,000 studied cases of malaria and had had no evidence of toxicity. Dr. M. E. WINCHESTER also agreed that using atebrin one can control, if not eradicate, malaria in a county: he advocated the concurrent use of drainage, drug control, screening and oiling. *N. W.*

GLYN-HUGHES (F.), LOURIE (E. M.) & YORKE (Warrington). **Studies in Chemotherapy. XVII.—The Action of Undecane Diamidine in Malaria.**—*Ann. Trop. Med. & Parasit.* 1938. Apr. 28. Vol. 32. No. 1. pp. 103–107. With 3 charts.

It had been shown previously by the authors that of a series of drugs tested, n-undecane 1–11 diamidine exhibited the greatest trypanocidal powers and produced permanent cures in infected laboratory animals. The discovery was also of academic interest, since the new drug has an entirely different chemical constitution from other trypanocidal substances. In the present paper experiments on the treatment of human malaria by the same substance are described. The patients were all neuro-syphilitics infected either by blood inoculation or by mosquito bites. Doses of 25 mgm. of the drug have been given intravenously twice daily and double this dose by mouth, without ill effects. In two cases 150 mgm. daily by mouth caused anorexia and nausea. No changes in the blood sugar, urea or N.P.N. or in the urine were noted during treatment. The results obtained in eighteen cases of simple tertian and in one case of quartan infection are given in tables, showing the number of paroxysms before and after treatment and the day after dosage on which the blood became parasite free. All cases were heavily infected when treatment began, and administration of the drug was followed generally after a further one or two paroxysms by cessation of febrile attacks, and a slow disappearance of parasites from the peripheral blood. The asexual forms were most affected. Relapses have been noted at from 4–8 weeks following first treatment. The authors do not recommend the drug for treatment. The importance of the observations lies in the fact that a new type of antimalarial has been discovered.

J. D. Fulton.

PIZZILLO (Giuseppe). Sulla cura di Maurizio Ascoli nelle infezioni malariche. Nota IX. Sinergismo adrenalino-chininico; adrenalina e chinino-resistanza. [**Ascoli's Treatment. Combined Action of Adrenalin and Quinine; Adrenalin and Quinine-Resistance.**]—*Riv. di Malariologia.* Sez. I. 1938. Vol. 17. No. 1. pp. 29–36. With 6 charts. German summary.

The author describes six interesting cases of malaria in which fever persisted in spite of very thorough treatment with quinine. In all of them quite small doses of quinine given by mouth, when associated with intravenous injections of adrenalin, very rapidly brought the temperature down to normal. He believes that these favourable results are brought about by adrenalin making all the blood accessible to the action of quinine. This method of treatment is of particular value in quinine-resistant infections. In two cases the injection of adrenalin alone increased rather than diminished the fever, changing its type from tertian to irregular remittant. *N. W.*

Hoops (A. L.). **Clinical Prophylaxis with Atebrin on a Malacca Estate.**—*Jl. Malaya Branch Brit. Med. Assoc.* 1938. Mar. Vol. 1. No. 4. pp. 329–333.

On an estate where anti-larval measures were only partially effective the weekly administration of atebrin to all members of the labour force succeeded in suppressing clinical manifestations of malaria. For continuous prophylaxis the doses recommended are :—two tablets twice a week for four weeks, and two tablets once a week thereafter.

N. W.

Swellengrebel (N. H.), de Buck (A.) & Kraan (H.). **Further Investigations on "Healthy" Human Carriers of** *Plasmodium vivax* **in North-Holland.**—Reprinted from *Proc. Roy. Acad. Sci. Amsterdam.* 1937. Vol. 40. No. 4. pp. 368–374.

By feeding *A. maculipennis atroparvus* on patients who had been infected with *Pl. vivax*, Madagascar strain, during the afebrile period following a series of paroxysms, the authors have assessed the infecting power of persons harbouring differing numbers of parasites in their blood. Persons harbouring one parasite per 100 leucocytes can infect 60 per cent., or more, of anopheles which feed on them once, even if no male gametocytes be found on the day of the infecting feed, provided gametocytes had been found at an earlier date and no salvarsan had been given. Carriers harbouring only one parasite to 1,000 leucocytes can infect but at a much lower rate.

During 1936, thirty-one families comprising 80 adults and 184 children were under observation. There were 6 good carriers (one parasite or more per 100 leucocytes) among 62 children who had malaria fever that year and 10 good carriers among 122 children who had no fever. There were 5 good carriers among 16 adults who had malaria fever that year and only one among 64 adults who had no fever. There were 3 carriers of male gametocytes among the 62 children who had malaria fever, and 7 among the remaining 122 children. There were 2 male gametocyte carriers among the 16 adults who had malaria fever and 2 among the remaining 64 adults. It appears that adult carriers likely to cause heavy anopheline infection are more likely than are children to become conspicuous by an attack of malaria. *N. W.*

Boyd (Mark F.), Carr (Henry P.) & Rozeboom (Lloyd E.). **On the Comparative Susceptibility of Certain Species of Nearctic and Neotropical Anophelines to Certain Strains of** *P. vivax* **and** *P. falciparum* **from the Same Regions.**—*Amer. Jl. Trop. Med.* 1938. Mar. Vol. 18. No. 2. pp. 157–168.

For these experiments *A. quadrimaculatus* and *A. punctipennis*, from the colonies maintained at the Florida Station for Malaria Research, and *A. albimanus*, reared from ova sent by air from Cuba and Panama, were used. The Nearctic strains of *P. vivax* and *P. falciparum* were the McCoy and Long strains maintained in the malaria therapy service, and the Neotropical strains were obtained from patients in Havana. These Cuban strains were proved by super-infection experiments to be immunologically distinct from the Florida

strains. The comparative experiments were made by applying to a suitably infectious patient two cages each containing not more than 20 anophelines of the species that were being compared. *A. quadrimaculatus* and *A. punctipennis* were both highly susceptible to infection by strains of *vivax* and *falciparum* derived from their own as well as from the Neotropical region. *A. albimanus* was highly susceptible to infection by strains of *vivax* and *falciparum* derived from Cuba but was refractory to certain strains from the Nearctic region. The inferences are drawn that the West Indian strains of *falciparum* and *vivax* might spread if introduced into the south-eastern United States but that the United States strains would only spread to a very limited extent, if at all, if introduced into Cuba or Panama. *N. W.*

Hu (Stephen M. K.). **A Brief Mosquito Survey of Foochow Region, South China.**—*Lingnan Sci. Jl.* 1937. Vol. 16. No. 4. pp. 579–584. [11 refs.]

A six weeks survey in July and August in and around Foochow resulted in the finding of twenty species of mosquitoes of which only two were *Anopheles, hyrcanus* var. *sinensis,* and *lindesayi.* The former was found breeding along the edges of running streams in the hills as well as in the stagnant water of rice-fields and ponds. On one occasion the larvae of this species were found in stone troughs containing clear rain water. Neither *A. minimus* nor *A. jeyporiensis* was found, though both these species have been reported from Mintsing which is only 28 miles from Foochow. A list is given of the twenty species of mosquitoes found with notes of the breeding places of each. *N. W.*

Toumanoff (C.) & Hoang-Tich-Try. Nouvelle contribution à la connaissance de la faune anophélienne de la haute altitude du Tonkin (Chapa). [**Anopheline Fauna in a Hill-Station of Tonking.**] —*Bull. Soc. Méd.-Chirurg. Indochine.* 1937. Oct. Vol. 15. No. 8. pp. 980–991. With 4 figs. (2 coloured) on 2 plates. [12 refs.]

The hill-station of Chapa is a health resort : malaria is all but non-existent, in striking contrast to Pho-moi at the foot of the hill below Chapa which is intensely malarious. At five surveys which were carried out in Chapa between 1931 and 1937 the spleen index of children varied between 0 and 3·03, and the parasite index between 0 and 6·81. People infected with malaria frequently go to Chapa and the anopheline fauna is varied, eleven species having been identified there. This is another example of anophelism without malaria. This is explained by the zoophile tendencies of the Anopheles. They can be found in large numbers in stables at night. Only few remain in the stables by day. Very rarely are anophelines to be found in human habitations. Fortunately there are numerous stables surrounding the town. Two forms of *A. jeyporiensis* have been found, the type form and *tonkinensis* s. *candidensis.* The latter is an important vector in Tonking. *A. maculatus* also occurs. *A. lindesayi* was found, as was *A. gigas* var. *baileyi.* Both are zoophile. Adults of the latter species are rare even in stables and it seems probable that it feeds chiefly on birds or other animals in the open. *N. W.*

Toumanoff (C.). Contribution à l'étude de la fréquence saisonnière des diverses espèces anophéliennes sur les hauts-plateaux d'Annam et dans la basse et moyenne régions de la Cochinchine et du Cambodge. [**Seasonal Prevalence of Anopheline Species on the Higher Plateaus of Annam and in the Lower and Middle Regions of Cochin China and Cambodia.**]—*Bull. Soc. Méd.-Chirurg. Indochine.* 1937. Oct. Vol. 15. No. 8. pp. 970–980. With 3 charts.

In spite of considerable differences in climate, more especially with regard to temperature, that characterize different parts of French Indo-China, there is very little difference in the seasonal prevalence of the more important anophelines in the different regions. It would appear that rainfall is of more importance than other meteorological factors in determining such seasonal prevalence. *A. minimus*, *A. aconitus* and *A. karwari*, which are stream-breeders, are more prevalent in the dry than in the rainy season, but this difference is less marked in the south than in the north. In the south *A. minimus*, and still more *A. maculatus*, are often found breeding in marshes as well. *A. vagus* and *A. kochi*, both of which breed in stagnant water, are more in evidence in the rains. *A. philippinensis*, *A. fuliginosus*, *A. maculipalpis*, and, to a certain extent, *A. barbirostris* and *A. tesselatus* have no marked seasonal prevalence: they are adapted to certain permanent breeding places, swamps, lakes, marshes, &c., which undergo but slight seasonal change. *A. hyrcanus*, which is frequently found in the south, is a stream breeder that is more in evidence in the dry season. Seasonal changes in hydrographic conditions are the most important, if not the only, factor in determining the seasonal prevalence of anopheline species in Indo-China. *N. W.*

Beklemischev (W. N.) & Zhelochovtsev (A. N.). La répartition géographique d'*Anopheles maculipennis* Meig. et de ses sous-espèces dans l'URSS. [**Geographical Distribution of** *A. maculipennis* **and its Sub-Species in Russia.**]—*Med. Parasit. & Parasitic Dis.* Moscow. 1937. Vol. 6. No. 6. [In Russian pp. 819–833. With 4 figs. [41 refs.] French summary pp. 833–835.]

A study of the varieties of *A. maculipennis*, distinguished by their egg characteristics, has been going on in Russia since 1932. The results of this study are reported in this paper. *A. maculipennis* is a holarctic species and is found almost throughout the northern temperate zone of two continents. It is found as far north as the belt of coniferous forest, and where this has been cleared it extends still farther north if the summer temperature is sufficiently high. In the continental climate of Russia the limit is as far north as 66°N. Its southern extension in Asia and Africa is determined by the heat of summer. The authors recognize five sub-species:—*messeae*, *typicus*, *atroparvus-labranchiae*, *sacharovi* and *occidentalis*. *A. maculipennis melanoon* is apparently grouped with *messeae*, and *subalpinus* is considered as probably a synonym for *melanoon*.

A. maculipennis messeae has the widest distribution: it is found throughout Europe except Spain and almost throughout Siberia. In eastern Europe and especially in Siberia it outnumbers all other species. It is indeed the only one of the sub-species found in Central and Eastern Siberia. It has not been found in Turkestan and its existence in Transcaucasia is doubtful.

A. maculipennis typicus is found throughout the north-east of the east European plain as far as the Urals. It has not been found hitherto in the south-east of that plain (Orenbourg). It has been found in Tomsk, Western Siberia, and at the foot of the Altai Mountains, but it is rare. In the Caucasus Mountains it is the only representative of the species, but it does not apparently occur in southern Caucasia. It has been found on the Turkmeno-Persian frontier. In Eastern Europe it is most prevalent in the highest places of the plain. The Caucasian form differs considerably from the European form. The area of distribution of *typicus* extends further north-south than any of the other sub-species: this is possibly explained by its two-fold method of hibernation. In the north it passes the winter in a cold-shelter and does not feed. In the south, like *labranchiae* or *atroparvus*, it is found in a state of gonotrophic dissociation.

A. maculipennis atroparvus is found in the basin of the Dniester and along the Dnieper, on the northern shore of the Black Sea, on the shores of the Sea of Azof, in the Southern Ukraine and in the steppes of Northern Caucasia. The northern limit of this sub-species coincides with the January isotherm of 7°C. It seems to be an essentially European variety, especially adapted to the temperate climate of the Atlantic.

A. maculipennis labranchiae is hardly ever found in Russia.

A. maculipennis sacharovi is found throughout Turkestan, south of the Kirchiz Mountains and in the plains of Azerbaijan, of Eastern Georgia, of Armenia, and of Daghestan as far north as Makhatch-Kala. It is absent from the Pontin shore and from the coastal plain of Lenkoran, places characterized by a damp climate. *N. W.*

DE MEILLON (Botha). **A Note on** *Anopheles gambiae* **and** *Anopheles funestus* **in Northern Rhodesia.**—*Publications of South African Inst. Med. Res.* 1937. Nov. Vol. 7. pp. 306–312. With 1 sketch map. [Publication No. XL.]

The paper discusses the natural range of flight of these insects.

The author had reason to suspect that *Anopheles funestus* was flying down the wind into a village in N. Rhodesia, from a distance of well over a mile. This was confirmed by staining and releasing adults. Of about 2,000 *gambiae* and *funestus*, 11 were recovered, all within 3 days of liberation. One had flown as far as 2·8 miles. It was observed that when stained adults were liberated about sunset, they flew straight upwards for about 20 feet and then moved away down wind.

In the author's experience *A. gambiae* breeds in essentially the same types of water in widely separated parts of Africa. *A. funestus* also shows no tendency to develop different breeding habits in different areas. *P. A. Buxton.*

DE MEILLON (Botha). **Some Reactions of** *Anopheles gambiae* **and** *Anopheles funestus* **to Environmental Factors.**—*Publications of South African Inst. Med. Res.* 1937. Nov. Vol. 7. pp. 313-327. With 3 figs. [14 refs.] [Publication No. XL.]

The author refers briefly to some previous papers on the relation of adult *Anopheles* to light and atmospheric humidity.

An apparatus was made in which mosquitoes could be kept in a stream of air, of which the humidity was controlled. When the finger was thrust into this apparatus it was found that *A. gambiae* would feed

over a very wide range of humidity, at 28–29°C. A very few experiments also lead to the tentative conclusion that, provided the mosquito can obtain blood every night, it can survive continuous exposure to very low humidity (20 per cent. at 26°C.).

Some preliminary experiments were also carried out in a chamber which offers a choice of humidity at one temperature. It was difficult to get consistent results, but the experiments show that the mosquito's reaction to humidity is much influenced by its own state of nutrition.

P. A. Buxton.

HADJINICOLAOU (J.). **Observations on *Anopheles marteri*, S. & P. (Diptera, Culicidae).**—*Riv. di Malariologia.* Sez. I. 1938. Vol. 17. No. 1. pp. 44–50. With 3 figs.

A. marteri was found breeding in numbers in a permanent stream on Mount Itis in central Greece at an altitude of 300 metres. Attempts at raising the larvae were successful in a cool basement in pans of water, the temperature of which was kept between 19° and 24°C. by means of an ice bath. The development from egg to adult was completed in 20 days. The larvae were first found in the latter half of June and could be found in abundance to the early part of October. During the summer months a hundred larvae could be collected in one dip. The eggs are uniformly black, somewhat like those of *bifurcatus*. They have, however, larger floats than have the eggs of *bifurcatus*, more than three quarters of the egg length ; the width of the float at its broadest part is one and a half times the width of the ventral surface of the egg between the floats. *A. marteri* appears to feed rarely, if ever, on human beings and so can be of no importance as a malaria vector. *N. W.*

DE BUCK (A.). **Some Observations on the Salivary and Stomach Secretion of Anopheles and Other Mosquitoes.**—Reprinted from *Proc. Roy. Acad. Sci. Amsterdam.* 1937. Vol. 40. No. 2. pp. 217–223.

This paper records the results of some interesting observations made on the secretions of the salivary glands and stomachs of *A. maculipennis*, *Th. annulata* and *C. pipiens*. The technique employed was simple. The salivary gland was put in a drop of distilled water on a slide and allowed to dry. After drying the residue was dissolved in a drop of saline solution. The author summarizes his observations as follows :—

" 1. The haemagglutinin in the salivary secretion of *A. maculipennis* is present in the median acinus only.

" 2. This agglutinin is not destroyed by prolonged drying, provided that the atmosphere it is kept in is absolutely dry, nor by dry heating at 99°C. It is destroyed by wet heating at 50°C.

" 3. The salivary glands of *Th. annulata* contain a weak haemagglutinin.

" 4. The anti-coagulin in the salivary secretion of *A. maculipennis* is present almost exclusively in the median acinus.

" 5. The anti-coagulin of *A. maculipennis*, *C. pipiens* and *Th. annulata* is not destroyed by prolonged drying nor by dry heating at 99°C.

" 6. The anti-coagulin of *A. maculipennis* is not destroyed by boiling ; that of *C. pipiens* and *Th. annulata* is destroyed by wet heating at temperatures higher than 50°C.

" 7. The secretion of the posterior portion of the mid-gut of *C. pipiens* and *Th. annulata* contains a coagulin.

" 8. This coagulin is not destroyed by prolonged drying, nor by dry heating at 99°C. It is destroyed by wet heating at 50°C.

"9. The secretion of the lateral acini of the salivary glands of *A. maculipennis* seems to be responsible for the irritating and wheal-producing action of the saliva."

N. W.

JACKSON (R. B.). A Guide to the Identification of the Anopheline Larvae of the Colony of Hong Kong. With Notes concerning them.—*Chinese Med. Jl.* 1938. Mar. Vol. 53. No. 3. pp. 259–270. With 14 figs.

NANDI (B. K.) & DIKSHIT (B. B.). **A New Colorimetric Test for Plasmoquine.**—*Indian Jl. Med. Res.* 1938. Apr. Vol. 25. No. 4. pp. 937–950. With 1 graph. [24 refs.]

A new colour test for plasmoquine is described which detects this substance at a dilution of 1/1,000,000 and allows of quantitative estimation at the same dilution if a spectrophotometer be employed. Dilutions up to 1/200,000 can be quantitatively estimated by means of a Dubose colorimeter. The method is an application of Folin's phenol reagent originally developed for tyrosine and tryptophane. A few drops of the reagent added to an aqueous acid solution of plasmoquine and then made strongly alkaline with sodium carbonate gives a blue colour which deepens to a maximum in half an hour, and remains constant for three hours. Pure reagents and blank determinations are recommended. The reagent is not specific for plasmoquine, phenolic substances interfere but are not extracted by ether in the method employed, and the test is not suitable for urine.

Tissues are weighed, cut and ground with silver sand, and 0·2 cc. of 20 per cent. NaOH added per gram. After drying at room temperature, extraction is carried out in a Soxhlet with ether for 1½ hours. The ether extract is then washed three times with minimal quantities of 2 per cent. sodium carbonate and the plasmoquine washed from the ether by 5cc. of 5 per cent. HCl. The HCl layer is rendered ether free by heating on the water bath. To 4 cc. of the extract is added 1 cc. of the phenol reagent, and then solid sodium carbonate till strongly alkaline. 4 cc. of standard plasmoquine solution of approximately equal strength are similarly treated. Centrifuging is carried out if a precipitate is present, and the volumes then made equal, preliminary to colorometric comparison. Blood can be treated in the same way 0·1 cc. of 20 per cent. NaOH being added for each 1 cc. and for extraction it may be dried or done wet in a separating funnel with ether.

With blood *in vitro* up to 96 per cent. of the drug has been recovered and the time factor has no influence on the amount recovered. A perfused frog gave 59 per cent. recovery and another 66 per cent. after injection. Mice injected hypodermically showed a recovery of 62 per cent. from all tissues after 2 hours and 81 per cent. when killed after 15 minutes. The amount of drug recovered from rats and guineapigs twenty-four hours after inoculation was small, due to alteration of plasmoquine by the organism, it is supposed.

The colour developed obeys Beer's Law. A theory of the mechanism of the colour development in a non-phenolic substance like plasmoquine is given. It is suggested that the methoxy group is demethylated by the phenol reagent, giving a free hydroxyl group, and substitution by the methyl group at some other point of the molecule.

J. D. Fulton.

HELMINTHIASIS.

KHALIL (M.) & AZIM (M. Abdel). **Further Observations on the Introduction of Infection with *Schistosoma haematobium* through the Irrigation Schemes in Asswan Province.**—*Jl. Egyptian Med. Assoc.* 1938. Mar. Vol. 21. No. 3. pp. 95–101. With 3 maps.

The introduction of perennial as opposed to basin irrigation has in certain villages tested, increased the amount of infection with *S. haematobium* from four- to nearly forty-fold in three years, as shown by the accompanying table.

	Rate of infection 1934	Rate of infection 1937
Sebaiia	10 per cent	44 per cent.
Kilh	7 ,, ,,	50 ,, ,,
Mansouria	11 ,, ,,	64 ,, ,,
Bimban	2 ,, ,,	75 ,, ,,

Factors governing the amount of increase are distance of irrigation canals from a village, time during which perennial irrigation has been in use, freedom of canals from aquatic plants, intake of silt from the Nile the deposit of which prevents flushing, too short an interval (5 days) between rotations to allow of drying of the canals. Arrangements are now made for clearing the canals yearly, making outflows into drains, and abolishing dead ends. *Clayton Lane.*

ZAVATTARI (Edoardo). Ambiente fisico e schistosomiasi vescicale in Libia. [**Environment and Vesical Schistosomiasis in Libya.**]—*Riv. di Biol. Colon.* Rome. 1938. Feb. Vol. 1. No. 1. pp. 5–27. With 4 figs. [51 refs.] English summary (9 lines).

The distributions of *Bulinus contortus* and of vesical schistosomiasis correspond in Libya ; they are found in the Sciati, Hofra and Agial depressions. *C. L.*

MARTINS (A. Vianna). Contribução ao estudo do genero Australorbis Pilsbry, 1934. [**Contributions to the Study of *Australorbis* Pilsbry, 1934.**] [Thesis.]—66 pp. With 6 plates (1 coloured). [58 refs.] 1938. Belo Horizonte.

SHAW (A. F. Bernard) & GHAREEB (A. Abou). **The Pathogenesis of Pulmonary Schistosomiasis in Egypt with Special Reference to Ayerza's Disease.**—*Jl. Path. & Bact.* 1938. May. Vol. 46. No. 3. pp. 401–424. With 32 figs. (2 coloured) on 13 plates. [25 refs.]

The unrealized importance of pulmonary damage as a cause of death in Egyptian schistosomiasis is emphasized by the statement that in 282 autopsies made on persons infected with *S. mansoni* or *S. haematobium* there were lesions in the lungs in 33 per cent., and in 2 per cent. these were the cause of death ; the significance of this

conclusion is the greater when it is added that 80 per cent. of the 282 deaths were not caused by the infection.

In the main the lung damage was due to embolism by ova coming from female worms outside the lungs and filtered out in the arterioles, which accompany the bronchioles, with their lumen of 50–100μ, and the damage is greater and the likelihood of death increased as these embolic showers are heavier and more frequent. The lesions are of three classes, parenchymatous tubercles, focal arterial lesions, and diffuse arterial damage or Ayerza's disease. Since the species of schistosome concerned cannot with certainty be determined by examination of sections, tissues from 36 of the bodies were soaked in 3 per cent. KOH solution; ova of *S. haematobium* were found in 69·4 per cent. and of *S. mansoni* in 41·7 per cent., so that in 11·1 per cent. both parasites were present. Although sectioning is not reliable for species differentiation, it is clear that serial sectioning played a great part in the forming of the conclusions reached.

Parenchymatous tubercles were present in 86 per cent. of autopsies; they form about ova which have escaped from the arteriole accompanying a bronchiole. If the escape has taken place towards the bronchiole the tubercle projects into this; if in the other direction into an alveolus; it is 250–375μ in diameter, the tissue change is limited to it, and its end is a fibrous scar with carbon pigment round an ovum calcified or not, and this last can and does rarely appear in the sputum. Focal arterial lesions in the lungs in this infection are believed to be new observations. As the ovum becomes impacted necrosis of the intima and media takes place without cellular reaction, the ovum becomes imbedded in the necrotic tissue, endothelium grows over it and thickens, and it is not till the egg becomes extravascular that a tubercle forms; the muscle is not repaired but aneurisms do not follow; in the thickened endothelium capillaries form, become dilated into an angiomatoid formation, and the muscle coat hypertrophies proximal to the obstruction caused by the endothelial thickening. The lesions are irreversible. In 6 cases (2·1 per cent. of all cases of schistosomiasis and 6·3 per cent. of those in which there were egg-induced lesions in the lung) these pulmonary arterial lesions were so widespread as to constitute Ayerza's disease; it is the result of repeated embolisms by eggs resulting in rows of tubercles marking out the outlines of vessels and later of the wholesale degeneration of the arteriolar walls leaving a naked eye appearance of the cut lung as of strands of silver wire; the myohypertrophy of the larger pulmonary arteries continues, in spite of the formation of angiomatoids, and atheroma sets in; the wall of the hypertrophied and dilated right ventrical may be thicker than that of the left, and all these persons died of congestive heart failure.

In 10 cases there were worms themselves in the pulmonary arteries (3 per cent. of all bilharzial cases and 10·5 per cent. of those with pulmonary lesions); in 8 of them all the worms found were dead, in 1 all were alive and in 1 there were both sorts; these were evidently there as emboli, for they lay at bifurcations of arteries, perhaps with their ends trailing into the branches; their death was followed by thrombosis and the collection of eosinophils, histiocytes and giant cells. When the worms lie in the systemic veins from the urinary system they and their eggs have a direct route to the right heart and lungs, when in the portal system they may escape being held up by the liver capillaries if collateral circulation has been open by dilatation of oesophageal veins or by vascular adhesions between liver and

diaphragm, and it is suggested that an adhesive quality in eggs may allow them to become attached to the vascular wall even when they are not held up as blocking emboli. *C. L.*

Khalil (M.) & Azim (M. Abdel). **On the History of the Anti-Bilharzial Campaign in the Dakhla Oasis.**—*Jl. Egyptian Med. Assoc.* 1938. Mar. Vol. 21. No. 3. pp. 102–106. With 1 map.

It appears that Bulinus snails have now been eliminated from the oasis and that infection with *S. haematobium* is no longer occurring.

The history began with the action of copper sulphate, 5 parts per million acting for 5 days with disappearance of Bulinus [this *Bulletin*, 1928, Vol. 25, p. 456]. They reappeared in 3 months and the process was repeated, no Bulinus being found 6 months later. An intensive campaign of tartar emetic injections was put through, and it was found that another canal, communicating with that which had been coppered was bringing in Bulinus. It was obliterated and the other stream again treated with copper. Visits in 1930, 1931, 1932 and 1936 found no Bulinus, though *Melania tuberculata* and *Limnæa truncatula* were prevalent. Moreover 70 children born since 1929 were uninfected, the relapse rate in previously treated persons was 34·5 per cent., but symptoms were milder and the area of cultivation, taken as a measure of working capacity, had increased 25 per cent. *C. L.*

Ashkar (M. F.). **Investigations on an Outbreak of Jaundice in Tala. (Menoufia Province).**—*Jl. Egyptian Med. Assoc.* 1938. Mar. Vol. 21. No. 3. pp. 131–137.

An outbreak of jaundice in February to April might, it was evidently suspected, be due to tartar emetic injections, but the same bottle of the drug had been used elsewhere without ill-effects, and analysis of it showed no impurities. The jaundice was of the parenchymatous type and associated with fever and enlargement of liver and spleen, so suggesting an infection which was, however, not traced. *C. L.*

Mueller (Justus F.). **The Life History of *Diphyllobothrium mansonoides* Mueller, 1935, and Some Considerations with Regard to Sparganosis in the United States.**—*Amer. Jl. Trop. Med.* 1938. Jan. Vol. 18. No. 1. pp. 41–66. With 37 figs. on 8 plates. [17 refs.]

D. mansonioides may be the source of sparganum infections in America.

When Mueller described *D. mansonioides* as a separate species reported from cats and perhaps from a dog [this *Bulletin*, 1935, Vol. 32, p. 655] he wrote of it thus :—

"*D. mansonoides* differs from *D. mansoni* as follows. The bothria are different in that their free edges are poorly developed, whereas those of *D. mansoni* are flourishing, and the width of the scolex is only 0·2 to 0·5 mm. as against 0·4 to 0·8 mm. for *D. mansoni*. A cross section of the scolex in *D. mansoni* makes a square ; in my material an oblong.

" The nerve trunks of *D. mansoni* are considerably more lateral as figured by Joyeux and Houdemer, than they are in *D. mansonoides*. Calcareous corpuscles are abundant in *D. mansoni*, rare in my worm. The vagina of *D. mansoni* is laterally winding, but does not deviate from the median course in my material ; furthermore the vagina of *D. mansoni* communicates directly with the exterior, without the terminal vestibule found in my species.

" The uterus makes three large anterior loops in *D. mansoni*, according to Joyeux and Houdemer ; four and one-half according to Faust, Campbell, and Kellogg ; and has no specialized terminal bulb. In *D. mansonoides* the uterus has only two large terminal loops, and a muscular terminal compartment set off by a sphincter. Since the anatomy of the uterus is absolutely constant in all my material there is no ground for assuming that this difference can be explained as variation.

" The egg of *D. mansoni* hatches in 21 days (Okumura, 1919), that of my material in not less than 50."

In the present paper the author states that :—

" In the widespread region where this worm afflicts native wild-life man must be constantly exposed to infection with procercoids wherever drinking water from natural sources is used. It is certain that infected Cyclops are widely scattered in natural bodies of water, with the inescapable consequence that these must occasionally be swallowed by man when drinking from, or possibly while swimming or bathing in such waters." *C. L.*

Joyeux (Ch.) & Baer (J. G.). Sur le développement des *Pseudophyllidea* (Cestodes). [**The Development of Pseudophyllidea.**]—*C. R. Soc. Biol.* 1938. Vol. 127. No. 13. pp. 1265–1266.

Bacigalupo (Juan). Nuevo huesped intermediario de la *Hymenolepis diminuta* (Rudolphi, 1829) Embia (Rhagadachir) Argentina, Navas. [*Embia argentina*, **a New Intermediate Host of** *Hymenolepis diminuta*.]—*Rev. Med. Trop. y Parasit.* 1938. Jan.–Feb. Vol. 4. No. 1. pp. 45–47. With 1 plate.

The author mentions *Dermestes vulpinus*, *D. peruvianus* and *Ulosonia parvicornis* as new intermediate hosts of *H. diminuta*, but the first has not proved to be able to carry the development beyond a certain stage, the two latter are common hosts. He now names a fourth, *Embia argentina*. Of two specimens allowed to feed on matter containing ova of the worm obtained from grey rats, one died after twelve days and in it were found immature larval stages ; the other died after 45 days and in its body cavity were completely developed cercocysts of the worm. [Other insects in which this stage has been seen are *Asopia* (*Pyralis*) *farinalis*, *Anisolabis annulipes*, and larvae in *Akis spinosa*, *Scaurus striatus*, and certain fleas, *Nosopsyllus fasciatus* and *Xenopsylla cheopis*.] *H. H. S.*

May (Herbert). Ueber Wurmerkrankungen. [**Helminthiases.**]—*Med. Klin.* 1938. Mar. 25. Vol. 34. No. 12. pp. 402–403.

At Lehr, in Baden, examination of stools from 828 persons, apparently by smear, disclosed these infections. *A. lumbricoides* 146, *T. trichiura* 100, *E. vermicularis* 7, tapeworm 1. The number in whom infections were found was 223. *C. L.*

Cochaux (I.). Helminthiases associées aux avitaminoses. Le nzadi ou lupusu des indigènes du Kasai. [**Helminthic Infections associated with Avitaminoses. The Nzadi or Lupusu of the Natives of Kassi.**]—*Ann. Soc Belge de Méd Trop.* 1937. Dec. 31. Vol. 17. No. 4. pp. 491–500.

Nzadi or lupusu is defined as a syndrome of bodily deficiency, ending sooner or later in death, caused by heavy infection with hookworms or ascarids combined with avitaminosis. *C. L.*

Keller (A. E.), Leathers (W. S.) & Knox (J. C.). **The Incidence and Distribution of** *Ascaris lumbricoides*, *Trichocephalus trichiura*, *Hymenolepis nana*, *Enterobius vermicularis* **and** *Hymenolepis diminuta* **in Seventy Counties in North Carolina.**—*Amer. Jl. Hyg.* 1938. Mar. Vol. 27. No. 2. pp. 258–274. With 1 map.

The authors' conclusions based on examination of 0·005 gm. of faeces in decinormal caustic soda solution are as follows :

" 1. Of a total of 37,346 specimens of feces obtained from white persons in 424 communities in seventy counties of North Carolina, 3,542 (9·5 per cent.) were found to contain eggs of *Ascaris lumbricoides*.

" 2. The incidence of ascaris in North Carolina prior to 1921 was 5·5 per cent. in 36,930 examinations.

" 3. In the Coastal Plain the incidence of ascaris was 6·5 per cent. in 19,294 examinations ; 3·9 per cent. in 12,170 examinations from the Piedmont Region and 30·7 per cent. in 5,924 examinations from the Mountain Area.

" 4. The average intensity of infestation for all the positive cases was 11,800 eggs per cc. of feces and did not show much variation even though the incidence of this parasite varied markedly in the different divisions of the state.

" 5. The incidence of hookworm in North Carolina in relation to geographical divisions of the state was found to be the reverse of that of ascaris.

" 6. The incidence of ascaris according to age was highest in the age periods 0 to 4, 5 to 9 and 10 to 14 years.

" 7. Of the total number of positive cases of ascaris, 71·1 per cent. were classified as very light ; 24·2 per cent. as light infestations and 3·5 per cent. and 1·2 per cent. as moderate and heavy respectively.

" 8. In an analysis of 1,794 families in which one or more persons were found to be infested with ascaris, the average worm burden per infested individual increased as the number of infested persons per family increased.

" 9. Of a total of 4,958 positive specimens in both white persons and Negroes, 36·5 per cent. contained unfertilized eggs only, with an average intensity of infestation of 2,100 eggs per cc. of feces ; 25·5 per cent. contained fertilized eggs only, with an average intensity of infestation of 11,800 eggs per cc. of feces and 38·0 per cent. contained both unfertilized and fertilized eggs, with an average intensity of infestation of 33,100 eggs per cc. of feces.

" 10. Of 6,301 specimens of feces secured from Negroes residing in 63 communities in 37 counties, 1,418 (22·5 per cent.) were found to contain ascaris eggs.

" 11. The incidence of ascaris in white persons in the same counties from which specimens from Negroes were secured was 7·0 per cent. in 16,904 examinations, as compared with 22·5 per cent. in 6,301 Negroes.

" 12. The intensity of infestation in Negroes was 27,000 eggs per cc. of feces, as compared with an average of 15,700 eggs per cc. of feces for white persons living in the same area.

" 13. In white persons 194 (0·5 per cent.) of the 37,346 specimens examined contained eggs of trichocephalus. The incidence of trichocephalus in the Coastal Plain was 0·3 per cent., in the Piedmont Region 0·5 per cent. and in the Mountain Area 2·0 per cent. The average intensity of infestation was 1,400 eggs per cc. of feces.

" 14. Of the 6,301 specimens examined for Negroes, 3·0 per cent. were found to contain eggs of trichocephalus. A high incidence of trichocephalus in Negroes was found in the following coastal counties : Hyde, 24·8 per cent. ; Craven, 23·6 per cent. ; Tyrrell, 14·8 per cent. ; Carteret, 14·2 per cent. and Washington, 10·7 per cent. The average intensity of infestation in Negroes was 1,500 eggs per cc. of feces.

" 15. The incidence of *Hymenolepis nana* in the total population in white persons was found to be 0·7 per cent. and among the negro population examined it was found to be 0·27 per cent.

" 16. Of the total number of specimens examined from white persons 250 (0·7 per cent.) contained eggs of *Enterobius vermicularis*. In only two of the 6,301 specimens secured from Negroes was the presence of enterobius demonstrated.

" 17. In the 37,346 specimens from white persons three infestations with *Hymenolepis diminuta* were found. In the 6,301 specimens secured from Negroes four infestations with that parasite were demonstrated."

C. L.

Halpérine (M. O.). Sur la question de la viabilité des oeufs des helminthes dans les composts des matières tourbeuses et fécales. [**The Survival of Helminthic Eggs in Mixtures of Peat Turf and Faeces.**]—*Med. Parasit. & Parasitic Dis.* Moscow. 1937. Vol. 6. No. 5. [In Russian pp. 619–625. With 1 chart. French summary p. 626.]

When faeces or other dirt is mixed with peaty matter the rise in temperature and loss of oxygen cause destruction of ascaris and trichuris eggs. The temperature is higher in the upper layers so that a stirring of the heap is needed. *C. L.*

Taylor (E. L.). **New Method for the Storage of Nematode Larvae.** [Correspondence.]—*Nature.* 1938. Jan. 29. Vol. 141. No. 3561. p. 205.

The method consists in placing on 1 or more 9 cm.-wide filter papers (Whatman No. 42), which are already standing on several thicknesses of blotting paper, water containing infective larvae from a Baermann apparatus. In 15 to 20 minutes, by which time the excess water has soaked away but the papers have not begun to crinkle at the edges, such papers are placed face to face in a petri dish of the same size, dish and lid are fastened together by a ring of adhesive plaster, and the whole is put away at 36°–40°F. After a year's storage 91 per cent. of such larvae were still alive and active. *C. L.*

Cipriano (Leonardo). Su 4 casi di occlusione intestinale acuta da ascaridi. [**Four Instances of Acute Intestinal Obstruction by Ascarids.**]—*Policlinico.* Sez. Prat. 1938. Jan. 31. Vol. 45. No. 5. pp. 196, 199–202. [25 refs.]

In all 4 of these children there was a knot of ascarids occluding the lumen of the small intestine, for which laparotomy was done. In one of them there was an added volvulus. Two died, of which the child with volvulus was one. *C. L.*

KANDELAKI (S. P.) & KAMALOV (N. G.). **The Helminthic Fauna of the Population of Georgia.**—*Med. Parasit. & Parasitic Dis.* Moscow. 1937. Vol. 6. No. 4. [In Russian pp. 459–472. With 1 folding map. English summary pp. 472–473.]

Ankylostomiasis is a very serious problem in Western Georgia.

Since 1929 some 75,000 persons have had faecal examinations by a method unstated in the English summary. Infections with helminths were detected in 57 to 100 per cent., average 91·3. Fifteen species of parasites have been found, and as many as 6 species in one person. The estimated number of infected is 300,000 and, if Abkhazia and Adjaristan are included, 500,000 ; clinically 9·1 per cent. are seriously ill, 44·6 per cent. not seriously ill and 46·3 per cent. are without discerned symptoms. As to age, infection is greatest between 11 and 40 ; it is greater in men than in women. The submontane regions, back from the coast, are most heavily infected with hookworms, in fact just those places where rainfall is greatest. Owing to cold, the manganese and coal industries do not suffer. On unworming 272 persons, *A. duodenale* comprised 8 and *N. americanus* 92 per cent. of the catch.

C. L.

LANCET. 1938. Feb. 5. pp. 357–358.—**Ambiguities in Hookworm Investigations.**

" Conflicting statements about the efficiency of anthelmintic drugs and the degree of hookworm infection in particular areas are largely the result of lack of precision in diagnosis. This vagueness is no longer justified and would not persist were these matters taken up for settlement with proper care and on a sufficient scale."

There are conflicting statements as to the value of 4 cc. of tetrachlorethylene for expelling hookworms ; PESSÔA and PASCALE [this *Bulletin*, 1938, Vol. 35, p. 281] gave two treatments in gelatine capsules to 8 persons, found no eggs to Willis's gravity floatation technique after the second, and concluded from counts of worms passed after each that one treatment expelled 95·8 per cent. of the worm load ; MAPLESTONE and MUKERJI [this *Bulletin*, 1938, Vol. 35, p. 282] gave the drug shaken up in saturated sodium sulphate solution to 90 persons, and using D.C.F. for detection of eggs got a cure percentage of 55 after one treatment and 70 after two. The use of a poor diagnostic technique will give a high and false rate of cure, and the use of D.C.F. by the latter workers has the significance that they urge that unworming, not egg counts, must be the basis for evaluating these drugs, and that the most accurate known diagnostic technique must be used ; moreover it was MAPLESTONE who suggested to WILLIS the conception of the technique which commonly goes by the latter's name. Further it is not certain that ancylostomes and necators were equally distributed in the two series, nor that 4 cc. of the drug were given in capsules seeing that it evaporates through them, so that the amount of the drug in them as they left the makers is not necessarily that given to patients later. The primary importance of the choice of the diagnostic technique is shown by work of Allen SCOTT in Egypt. He used on 253 faecal specimens the Stoll-Hausheer dilution technique. When the amount of faeces so examined was 0·005 gm. he found 89 positives, when it was 0·015 gm. these numbered 109. The floatation technique used as a routine in Egyptian hospitals had shown

76, and Scott found that in a series of stools the Willis technique always gave higher figures than the dilution one. Egyptian hospitals, by virtue of the technique they use for hookworm diagnosis, are accordingly missing numbers of infections. 1937 has then added knowledge leading to the conclusion that D.C.F. is the most accurate diagnostic method available, that a single 12-tube centrifuge can make available for examination 250,000 faecal specimens yearly and that the technique can detect a single, normally ovipositing female hookworm. *C. L.*

Rudolfs (Willem). **Hookworm in Sludge.**—*Engineering News-Rec.* 1937. Nov. 4. Vol. 119. No. 19. p. 762. [Summary taken from *Public Health Engineering Abstr.* Wash. 1938. Feb. 5. Vol. 18. Signed R. E. Tarbett.]

There is evidence that pathogenic bacteria are destroyed during digestion of sewage solids; the organisms disappear quite rapidly and cannot be found in thoroughly digested sludge. Less information is available that hookworms, and especially their eggs, are destroyed in an ordinary digestion tank. Experiments published on the viability of hookworm eggs stored for a number of months in faeces indicate that under these conditions the eggs may hatch. Some unpublished experimental evidence indicates that a small percentage of eggs may survive digestion under certain conditions.

In Singapore . . . the practice of heating digested sludge before discharge onto drying beds has been substituted as a means of destroying hookworms and their eggs. The entire mass is brought to a minimum temperature of 150°F. and maintained at that temperature for at least 30 min. This effectively destroys the organism.

Scott (J. Allen) & Headlee (W. H.). **Studies in Egypt on the Correction of Helminth Egg Count Data for the Size and Consistency of Stools.**—*Amer. Jl. Hyg.* 1938. Jan. Vol. 27. No. 1. pp. 176–195. With 2 figs. [15 refs.]

"A study has been made of the weights of series of consecutive stools passed by 139 Egyptian peasants during a period of several days. On the basis of an analysis of the data from this study in comparison with data available in the literature, certain conclusions have been drawn as to the bearing of stool size on helminth egg counts. It is the opinion of the authors that the available evidence indicates that correction of helminth egg count figures for the consistency of stools is unnecessary. Although the simpler, uncorrected values are sufficient, it is recommended that future papers give data in such a way that both corrected and uncorrected values be obtainable for purposes of comparison with those studies where only corrected figures have been given. Correction of egg counts for the smaller size of children's stools does not rest on adequate evidence. At present there seems to be no need for correcting data from children over 5 years of age. Feces passed by typical Egyptian peasants above 5 years of age weigh, on the average, about 200 gm. per day, or approximately 100 gm. per day, basis formed feces." *C. L.*

Minamizaki (Yushichi). **A Study of the Viability of Hookworms in the Intestine.**—*Jl. Public Health Assoc. Japan.* 1938. Mar. Vol. 14. No. 3. pp. 1–6.

Hookworm infection was acquired by a deliberate walking barefoot over farm land on two occasions. Eggs first appeared 58 days after

the first opportunity of infection and were increased in numbers 50 days after the second. Treatment brought away some worms, neither its kind nor the species of worm being mentioned in the English summary. On its failure to remove all worms, the presence of eggs in the stool was watched by " sedimentation method," " precipitation method " or " centrifuge method " ; they persisted for 7 years.

C. L.

GARIN (Ch.). Un cas d'infestation massive par l'ankylostome duodénal, sans signes cliniques. [**Heavy Infection with** *A. duodenale* **in One who had no Symptoms.**]—*Bull. Soc. Path. Exot.* 1937. Dec. 8. Vol. 30. No. 10. pp. 874–876.

Clinical symptoms, eosinophilia and marked anaemia do not appear in those infected with hookworms unless the infection is both heavy and chronic.

The single case reported is a miner of 47 years examined, perhaps as a routine, with the finding of hookworm eggs, red cells 4,080,000, haemoglobin 80, eosinophils 1. Treatment with tetrachlorethylene produced 302 worms, which according to the paper's title were *A. duodenale.* The dose of tetrachlorethylene and the presence or absence of eggs after it are not mentioned. Diagnosis was by a modified Telemann's technique [this *Bulletin*, 1932, Vol. 29, pp. 756–7]. It is held on the basis of this technique that infection was of 7½ months, with the conclusion noted. *C. L.*

LANDSBERG (J. W.). **The Blood Platelets in Hookworm Anemia.**—*Amer. Jl. Hyg.* 1938. Mar. Vol. 27. No. 2. pp. 316–320. [15 refs.]

In hookworm anaemia induced by experimental infections with *A. caninum* in dogs, the thrombocyte count is not reduced, neither is clotting delayed.

In the control group 214 determinations on 82 dogs gave a mean of 154,879 platelets to the cubic millimetre, with a standard deviation of 3,307. In 13 dogs dying from acute fatal hookworm anaemia there was a progressive lowering of haemoglobin but not of blood platelets, for each haemoglobin level they tended to scatter about the mean established on the uninfected animals. In 16 dogs receiving non-fatal hookworm infections, the thrombocytes displayed no definite trends ; thus the mean counts before infection were 141,500, at the time when the haemoglobin value was lowest they were 146,290, and after recovery 128,500. One of the known changes when anaemia is aplastic, that is to say is due to some poisoning of the bone marrow, is a reduced platelet count ; there is, then, once more no evidence of any toxin produced by hookworms and causing hookworm anaemia ; nor is there any evidence of lack of clotting power in this anaemia, for in nearly 2,000 punctures of the marginal vein of the ear the blood clotted rapidly during all stages of the infection. *C. L.*

SALAH (M.). **Mechanism of Oedema in Helminthic Anaemias.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1938. Jan. 25. Vol. 31. No. 4. pp. 431–436. [13 refs].

" Twenty-two cases of helminthic anaemia with oedema were subjected to critical clinical, biochemical and therapeutic studies in order to investigate the various causative factors and the mechanism of production of the

oedema. The following results have been obtained :—Three cases showed a circulatory factor. Three cases were due to the anaemic state. Twelve cases showed hypoproteinaemia (biochemically investigated) ; four additional cases responded to high protein diet. Neither the hypoproteinaemic nor the normal cases showed any evidence of avitaminosis B_1. In addition to the demonstration of the various causative factors that may be concerned in the production of this oedema and the blood changes associated with it, the investigation indicates new lines of treatment for this condition. By replacing the deficiencies in the blood chemistry the equilibrium will be re-established, and not only the disappearance of the oedema but also adequate blood regeneration will be helped."

C. L.

Chaves (Jose). **Shoes, versus Other Means of controlling Uncinariasis.** —*Bull. Dept. Health, Puerto Rico.* 1937. July. Vol. 1. No. 5. pp. 88–91. [Summary taken from *Public Health Engineering Abstr.* Wash. 1938. Apr. 2. Vol. 18. Signed M. C. Hall.]

The use of shoes is noted as one of the classical methods of aiding in the prevention of infection by larval hookworms entering the feet from contaminated soil. However, shoes have limitations in their protective role, and Payne pointed out in 1929 that wet canvas shoes are readily penetrated by hookworm larvae ; that larvae migrate over the surface of wet shoes, and may thus pass over the tops and enter the skin ; and that larvae readily enter minute defects in the leather stitching, thus limiting the time during which ordinary shoes will give complete protection to a hard-working labourer. Chaves points out that in Puerto Rico children are likely to wear their shoes to school, although they walk on hard roads to an uncontaminated and sanitated environment at the school, and then take their shoes off at home, in an environment likely to be unsanitated and contaminated with hookworm larvae.

Hence, comprehensive measures, anthelmintic medication and construction and use of sanitary latrines are more important, and shoes have only auxiliary usefulness.

Pessôa (Samuel B.). Pesquizas sobre a ancylostomose em São Paulo. VII. Sobre a eliminação de *Necator americanus* e de *Ascaris lumbricoides* após tratamento anthelminthico. [**Ankylostomiasis in São Paulo. VII. Expulsion of** *N. americanus* **and** *A. lumbricoides* **by Treatment.**]—*Folha Med.* 1938. Jan. 15. Vol. 19. No. 2. pp. 13–14.

Treatment of hookworms was by a mixture of carbon tetrachloride and oil of chenopodium followed by a saline, of ascaris by oil of chenopodium. The doses, and the ascaridol content of the oil, are unstated.

In 5 cases the number of necators found in the first stool compared to the total collection was 34 of 510 ; in 6 others the first two stools disclosed 690 of 1,092 ; in 20 heavily infected cases in which all stools were examined for 2 days, 6,150 came away on the first day and 3,143 on the second ; in 20 lightly infected cases these figures were 32 and 263. In 10 cases of ascaris infection, 44 came away on the first day and 43 on the second ; and in 4 cases in which the stools were examined for 4 days the figures for each day were 3, 4, 0 and 23, in one no worms were passed till the fourth day and on that day 11.

The work of MAPLESTONE and MUKERJI is, then, confirmed; examination of stools for worms for 1 day only gives no true picture of the numbers present. *C. L.*

i. D'ANELLA & TOURENC. Sur deux cas d'intoxication mortelle par le tetrachlorure de carbone. [**Two Deaths from Carbon Tetrachloride.**] —*Bull. Soc. Path. Exot.* 1938. Feb. 9. Vol. 31. No. 2. pp. 124–125.

ii. SANDGROUND (J. H.). **Newer Drugs for the Treatment of Tapeworm Infestations. Some Results obtained with Carbon Tetrachloride, Tetrachlorethylene and Hexylresorcinol.**—*New England Jl. of Med.* 1938. Feb. 17. Vol. 218. No. 7. pp. 298–304. 24 refs.]

iii. VAN WYMEERSCH (H. M. O.). Note concernant l'emploi de l'entelmintina dans le traitement de l'ankylostomiase grave. [**Notes on Entelmintina Treatment in Heavy Ankylostomiasis.**]—*Ann. Soc. Belge de Méd. Trop.* 1937. Dec. 31. Vol. 17. No. 4. pp. 583–587.

——. Note complémentaire concernant l'emploi de l'entelmintina dans le traitement de l'ankylostomiase.—*Ibid.* pp. 589–596.

iv. PEU-DUVALLON (J.). La maladie ankylostomiasique et son traitement. [**Ankylostomiasis and its Treatment.**]—*Bull. Soc. Path. Exot.* 1938. Mar. 9. Vol. 31. No. 3. pp. 220–224.

v. ERHARDT (Albert). Testierungsmethode Ancylostoma-wirksamer Präparate und chemotherapeutische Untersuchungen an der Ancylostomiasis der Katze. [**Testing Antihookworm Remedies and their Chemotherapy in Cats.**]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1938. Mar. Vol. 42. No. 3. pp. 108–117. With 2 figs. [22 refs.]

i. Two deaths from carbon tetrachloride given in the Cameroons for trichuris infection. Both were adults, both had a dose of 3 cc., and in both yellow fever is held to be out of the question.

The one entered hospital on the 4th day, jaundice having appeared the day before. Jaundice was deep, the liver enlarged 2 fingers below the costal margin, tender particularly to percussion; there were lumbar and right hypochondriac pains, no fever, pulse slow, hiccup, urine at first albuminous became suppressed. Examination of the liver made in the Pasteur Institute, Paris, showed no fat, no cellular necrosis, large patches of cirrhosis, macrophages with yellow pigment, diffuse infiltration, biliary canals contracted and irritated. The second man began to be ill the day after taking the carbon tetrachloride and came into hospital 6 days later with marked jaundice, bilious vomiting, continuous bilious diarrhoea, strong pulse, 100 gm. of dark, albuminuous urine in 24 hours. On the 9th day his temperature rose to 38°C. and he died on the night of the 10th day; the state of the liver showed no cellular necrosis, little fat, marked leucocytic infiltration, hypertrophy of Kupffer's cells, hyperplasia and malformations of nuclei, abundant vascular pigment; in the kidney were granular degeneration of convoluted tubes, many blood casts, marked interstitial sclerosis, black pigment, sometimes oedema and endothelial reaction in glomeruli. A note by LEFÈVRE, Director of the Health Service reports that the carbon tetrachloride used had undergone change and that phosgene was present. He urges the use of the fresh drug only and bearing in mind that hepatic and renal insufficiency absolutely contraindicate the use of carbon tetrachloride.

ii. Since the results obtained by male fern are exceedingly erratic and an appreciable number of deaths have followed its use Sandground has treated 16 cases with carbon tetrachloride in a usual dose of 4 cc., 8 with tetrachlorethylene 4 cc. and 24 with hexylresorcinol 1 to 6 gm. in sugar coated pills. Of 16 treated with the first, the parasites were eliminated in 12, 3 were not properly followed and 1 vomited the drug ; tetrachlorethylene was effective in 3 of 8 and hexylresorcinol in 7 of 24.

" Carbon tetrachloride may be confidently recommended on the score of its efficacy and general safety. Tetrachlorethylene and hexylresorcinol are reputed to be less toxic ; because of their safety, either of these drugs may be prescribed for patients in a debilitated condition where other remedies are contraindicated. Further trials with larger or repeated doses, after preliminary evacuation of the gastrointestinal tract, may show that hexylresorcinol and tetrachlorethylene have a greater taeniacidal value than is indicated by the present experience."

iii. Entelmintina is perfectly safe, always efficacious, may be entrusted to the unqualified infirmarian, and given fasting or on a full stomach. Given 3 times it seems that no hookworm can resist it.

The drug is described as apsidinolo-filicic acid. The dose is 1 gm. given on each of three days. The recommendation as to safety is based on 37 cases and cure was not recorded until a stool had been carefully examined on eight occasions.

iv. There is, it is insisted, a hookworm dysentery, and the proper treatment of the infection is by Didakol or, in default of this, pure carbon tetrachloride 4 gm., " essence " of chenopodium 0·4 gm., chloroform 1·5 gm., water 100 cc., followed by 20 gm. each of the sulphates of soda and magnesia.

There were so treated 90 persons, and 47 others without the chloroform ; there has been no symptom of intoxication of any degree at all and it is emphasized with italics that the mixture is harmless and gives 95 per cent. of complete successes, though the diagnostic method is unstated.

v. First there was tested the percentage of *A. caninum* (which is concerned throughout) which became adult after a known number of infective larvae had been given by stomach tube ; it varied from 6·4 to 33·4 ; in cats of 600–700 gm. 50 adult worms will kill ; eggs begin to be passed 3 weeks after infection. While the number of eggs passed daily by each thoroughly mature female worm has been put at from 7,200 to 28,400 Erhardt found it to lie between 373 to 2,520 per gram of faeces or 7,300 per female [if the Szidat-Erhardt unassessed method of collecting eggs from faeces is accurate (see this *Bulletin*, 1933, Vol. 30, p. 678)]. Filmaronol in doses of 2 cc. per kilo [over 4 oz. for a man of 70 kg.] unwormed 3 cats. Carbon tetrachloride in doses of 0·66 cc. per kilo [nearly 1 oz. for a man] was equally effective, but was apt to kill the cats. Ascaridol in doses of 0·05 cc. per kilo unwormed 1 of 8 cats and brought away none of the worms from another. When the two last were combined no enhancement of anthelmintic value could be depended on.

[In view of the grave state of affairs again made evident by these papers, it has seemed justified to make of these abstracts a symposium with comments.

i. These two persons had, as is at present customary, twice the minimum lethal dose of carbon tetrachloride. The blame for death is laid on the use of a supply of carbon tetrachloride that had undergone change with age and contained traces of phosgene. In other like

fatalities traces of carbon bisulphide have been blamed; yet, when KHALIL added 5 cc. of carbon bisulphide to the dose of carbon tetrachloride he gave to monkeys he did not succeed in killing them. The intensely poisonous nature of phosgene is well known, but what is the evidence in these two cases that phosgene was the cause of death? It is not allowable on such grounds to shift any blame for such deaths from carbon tetrachloride itself, which indeed can kill. Finally, if that is so, one is faced with the conclusion that this anthelmintic cost the lives of two persons to whom it was given to get rid of a trivial infection whose likelihood of causing death may be disregarded.

ii. Because male fern has caused death it is advised that something else should be used to drive out tapeworms, one of the drugs given in 16 cases being carbon tetrachloride in yet larger doses than were fatal as reported in the last paper. Maurice C. HALL held that for the effective evaluation of an anthelmintic 100,000 administrations should be followed up.

iii. Here is a view as to relative safeties as emphatic as the last, but just the opposite. The selected drug's safety is based on administration to 37 persons treated with a preparation of male fern, and its appraisement disregards the consideration that, if a sufficiently poor technique is used to test unworming, poor drugs may appear to give most gratifying results.

iv. An equally emphatic view based on 90 treatments is that if a dose of carbon tetrachloride is mixed with chloroform (whose action on the liver is similar) and with a chenopodium preparation (the active principle of chenopodium, ascaridol, being an active poison) it is harmless, while the anthelmintic effect is stated without offering any evidence as to the efficacy of the unknown test used.

v. The gratifying anthelmintic effects got in cats with 30 times the minimum dose per kilo which has killed man has no importance for man though it may escape notice that in some cases the desired effect was got by poisoning the host to death.

These conflicting views, each of which has fully satisfied its promoter, show how urgently is needed an inquiry on a sufficient scale into the safety and efficiency of anthelmintics. No prejudice in favour of old or new drugs should be permitted to influence its scope and findings.]

C. L.

SNOEK (W. Th.). Besmetting met *Anguillula intestinalis* (*Strongyloides stercoralis* Bavay). [**Infection with** *Strongyloides stercoralis*.]—*Nederl. Tijdschr. v. Geneesk.* 1938. Feb. 5. Vol. 82. No. 6. pp. 633–638. With 2 figs. on 1 plate. [13 refs.] French summary.

Infection with *Strongyloides stercoralis* is rare in Western Europe and most cases occur amongst miners. Some years ago an epidemic was described in Cornwall. The symptoms though mostly not very pronounced may occasionally become severe and fatal cases have been known to occur. The author treated two cases with de Langen's method and obtained very good results. Twenty intravenous injections of tartar emetic in 60 mgm. doses were given and at the same time capsules of gentian violet were administered orally three times a day in doses of 200 mgm. up to a total amount of 12 grams.

H. Lomas.

Osburn (H. S.). **Strongyloidiasis in Natal.**—*South African Med. Jl.* 1938. Apr. 23. Vol. 12. No. 8. pp. 292–294.

" Five cases of infestation by *Strongyloides stercoralis* are reported.
" In two of the cases, both showing diarrhoea and a well-marked degree of anaemia, it is considered probable that the symptoms were entirely caused by the *Strongyloides* infestation."

C. L.

Desportes (C.). Complément aux recherches sur la fréquence du trichocéphale et de l'oxyure à Paris. [**A Complement to Researches on the Incidence of Trichuris and Enterobius in Paris.**]—*Ann. Parasit. Humaine et Comparée.* 1938. Jan. 1. Vol. 16. No. 1. pp. 17–21.

A re-examination of material from autopsies on persons dying of various complaints in the old Hôpital de la Pitié by Brumpt in 1909 and preserved since that date.

The material consists of caecum and appendix. For trichuris there were examined 369 caeca with 50·7 per cent. infected, the maximum number in one organ being 82 : the corresponding figures for the appendix were 369, 8·5 and 1. For enterobius the caeca examined were again 369 with 8·4 per cent. infected, and a maximum number of 52, the appendices numbered 352 with less than 1 per cent. infected and a maximum of 9 in one organ. Balland had examined 389 caeca and appendices for a thesis published in 1910, from the same material and reported 54·7 per cent. infected with trichuris and 12·8 per cent. with enterobius, the present combined figures being 52·4 and 9·06.

C. L.

Dinnik (J. A.) & Dinnik (N. N.). Influence de la température, de l'absence d'oxygène et du desséchement sur les oeufs de *Trichocephalus trichiurus* (L.). [**Effect of Temperature, Absence of Oxygen and Drying on Trichuris Eggs.**]—*Med. Parasit. & Parasitic Dis.* Moscow. 1937. Vol. 6. No. 5. [In Russian pp. 603–617. With 3 figs. [11 refs.] French summary p. 618.]

The time taken for development of the trichuris eggs, from the single cell stage in fresh faeces to that of a larva, is, at 15°C. 120 days, 20°C. 57, 25°C. 29, 30°C. 17·5, 35°C. 11 days. At 0°C. development stops but life is retained, at 40°C. three-quarters of the eggs die and development is confused. At 30°C. life at all stages is maintained for 6 days in the absence of oxygen ; with lowering of the temperature this period is increased ; the two-cell stage is the most vulnerable. Dried eggs survive for long, and resistance to drying increases with time, the shells apparently becoming less permeable as time passes.

C. L.

Wright (Willard H.) & Cram (Eloise B.). **Studies on Oxyuriasis. IV. Some Aspects of the Problem of Therapy.**—*Amer. Jl. Dis. Children.* 1937. Dec. Vol. 54. No. 6. pp. 1276–1284.

Enterobius infection is often familial, with eggs scattered on clothing, furniture and soap in overcrowded families, and all members of such must be treated at the same time by some safe and efficient method.

"No method of therapy at present available meets these requirements, since there is no known anthelmintic which in single doses will remove all the worms from every patient or all the worms from nearly every patient and which is sufficiently safe for use with persons of all age groups. In our investigations tetrachlorethylene came closest to meeting these specifications for single dose treatments. The use of a relatively nontoxic anthelmintic in daily doses over a period of time appears to us to be the most desirable method of therapy, but santonin, which is such an anthelmintic, was not effective in our tests. The fact that oxyuriasis is frequently a familial condition complicates the matter of control and necessitates simultaneous treatment of all infested members of the family. The use of enemas, medicated or non-medicated, with or without oral medication, is of value, but the prolonged course of treatment necessary in most cases discourages the average person, who lacks the persistence to carry out the necessary routine of treatment, particularly in large families in which many persons are infested. The use of anal plugs, medicated jellies and anal ointments may be an aid in the control of the disease, but as a rule cannot be depended on to eradicate infestations. Our experience indicates that there is still need for a cheap, effective anthelmintic which can be administered with safety to persons of all ages and which can be used with a minimum of effort."

The work has been put through in conjunction with medical practitioners. *C. L.*

SCHEIFLEY (Charles H.). **The Prevalence of Trichinosis.**—*Amer. Jl. Hyg.* 1938. Jan. Vol. 27. No. 1. pp. 142–148. With 1 fig. [15 refs.]

An analysis of 2,597 examinations made in human autopsies reported by various writers since 1901 makes the percentage of trichinous infection in the United States 12·3, while various considerations suggest that it is actually about 20.

Examination has been either by pressed muscle or by digestion or by both. Usually it is the diaphragm which is examined by compression; as to this, THORNBURY reported that, in 1,043 swine found positive, a quarter were missed in the specimens taken from this muscle only, and other workers too have shown how this method fails. As to gastric digestion, Scheifley reports that while living larvae survive it, dead larvae are converted into a mass of small fragments unrecognizable in the debris found on sedimentation. Of the 2,597 cases analyzed the percentage of infection disclosed by digestion was 15·7 and by compression 7·5 and it is calculated (on experience with a series of 35 cases) that the number missed by digestion owing to the death of the measles was such that the actual incidence was about 23 per cent. It is again insisted that this heavy rate of infection was undiagnosed during life, and that this shows that many people in the United States eat raw or undercooked pork, and that the incidence of the infection in swine in the United States must be high, MAGATH indeed had put it between 2 and 4 per cent. *C. L.*

VAN SOMEREN (Vernon D.). **The Excystment of Trichinella Larvae in Artificial Gastric Juice.**—*Jl. Helminthology.* 1937. Dec. Vol. 15. No. 4. pp. 177–182. With 4 figs.

The excystment of these larvae in artificial gastric juice was watched taking place from voluntary muscles of a polar bear which died in the London Zoological Gardens.

The cysts were unusual, oval, with fat aggregated at the poles. " The walls of the cysts are partially calcified round one pole only, the other pole showing only slight calcification . . . . . each cyst is filled with a clear viscous fluid, while immediately adjacent to the larva is a granular jelly-like mass." Cysts dissected free, were placed in one of three solutions: (1) artificial gastric juice (1 per cent. granular pepsin and 0·5 per cent. hydrochloric acid), (2) 0·5 per cent. hydrochloric acid, (3) normal saline, and were kept at 37°C. In solution 1 the calcium had dissolved in 5 minutes, as it also had in solution 2. In about 15 minutes in gastric juice digestion of the cyst wall allows escape of the jelly, and with that escape the larvae begin to be active and become increasingly so. The larval tail escapes through a hole made by digestion of the cyst wall and it pulls itself out, the jelly which has escaped is digested and the cyst wall collapses, the process being complete in about 35 minutes. The impression left was that the larva's part in gaining release was not by any secretion of its own but by its active movements in utilizing digested holes in the cyst wall. The question is raised whether general calcification of the cyst wall, seen in older measles, would prevent excystment, seeing that the local digestion of the wall in the cysts watched took place where calcium deposit was least and the wall thinnest, namely near the embryo. *C. L.*

DEFICIENCY DISEASES.

GERMAIN (A.), MORVAN (A.) & BABIN (R.). Béribéri, déséquilibre alimentaire et fermentations intestinales. [**Alimentary Disequilibrium and Intestinal Fermentation as a Cause of Beriberi.**]—*Bull. Soc. Path. Exot.* 1938. Feb. 9. Vol. 31. No. 2. pp. 147–154. [Summary appears also in *Bulletin of Hygiene.*]

It is stated that beriberi results not only from a lack of vitamin B_1 in the diet, but also at times from an increased intake of carbohydrates and from an excess production in the intestine of acids of fermentation, especially lactic acid. A case is described in detail of a patient receiving a very high carbohydrate diet which contained what would ordinarily have been an adequate amount of vitamin B_1. The man took alcohol only to a moderate degree. He developed polyneuritis, oedema and tachycardia. A diagnosis of beriberi was made. The intake of carbohydrates was drastically reduced, and bismuth subnitrate and kaolin were given to absorb intestinal acids. No extra vitamin B_1 was given. The pathological symptoms of beriberi disappeared.

Douglas C. Harrison.

PRICE (Norman L.). **"Alcoholic" Beri-Beri.**—*Lancet.* 1938. Apr. 9. pp. 831–834. With 2 figs. [19 refs.]
LANCET. 1938. Apr. 9. pp. 851–852. **"Alcoholic" Beri-Beri.** [Summary appears also in *Bulletin of Hygiene.*]

A case is described of alcoholic beriberi, the symptoms of which were breathlessness, loss of appetite and weight, abdominal pains, leg swelling, muscle tenderness, rapid heart beat (120), etc. This case was diagnosed as acute heart failure. The dietary history was bad—irregular meals, mainly white bread and butter and tea, and 3 to 5 pints of beer a day. Large amounts of marmite and Bemax were given by mouth, and later, intramuscular injections of Betaxan equivalent to 4 mgm. crystalline B_1 daily. After 3 months' treatment, there was a gain of 30 pounds in weight, and the patient was free from any sign of cardiac or nervous disease. The assumption that B_1 deficiency is the root cause of all forms of secondary beriberi is discussed. The intake of B_1 is nearly always low in these cases, especially in chronic alcoholism where loss of appetite causes the proportion of alcohol to ordinary solid food taken to become even greater, the anorexia in all probability being due partly to B_1 deficiency. Evidence tends to show defective absorption in these secondary cases of beriberi, achlorhydria nearly always being present, and much greater curative effect being obtained by injection of B_1 than by oral administration. There is almost certain to be an increased need of B_1 on a high alcohol diet, as the requirement of B_1 depends on the type of food eaten, a high protein and fat diet requiring less B_1, a high carbohydrate diet using up more B_1 for carbohydrate combustion. Alcohol can replace carbohydrate almost completely as a fuel and therefore probably demands a greater supply of B_1, although alcoholic beverages are themselves practically devoid of it. All these considerations point to the conclusion that alcoholic beriberi is a true B_1 deficiency disease. The editorial comment recalls that for some years alcoholic neuritis has been cured by B_1. It is suggested by some workers that

the nervous complications of nutritional anaemia have been advantageously treated by B_1 as well as liver extract. The administration of thyroid increases the B_1 requirement. *Douglas C. Harrison.*

HAWES (R. Brunel). **The Treatment of Acute Fulminating Cardiac Beriberi (Shöshin).**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1938. Mar. 17. Vol. 31. No. 5. pp. 474–482.

The symptoms of the dying case of beriberi are described. The author then relates his experience with these cases when pure vitamin B_1 is administered and cites a number of typical cases. When sufficient vitamin is given, the result is startling—a dying man was injected in the morning and walked the length of the ward in the afternoon. Huge doses are required, 2000 I.U. being given in some cases in one injection. If the dose is too small, a short temporary improvement results, followed by collapse. The author sums up the results of his investigations :—the vitamin is non-toxic and the effect of one dose is lasting. If this is given by injection and in sufficient quantity, the effect is very rapid. *Douglas C. Harrison.*

LANDON (J. V.) & WILLIAMS (C. D.) **A Note on Epidemic Dropsy.**—*Brit. Med. Jl.* 1938. Jan. 15. p. 119.

Brief notes are given of three cases of epidemic dropsy, all Bengalees, a man, his wife and his sister. The clinical conditions were typical. All three lived in the same house and had meals together, and mustard oil was in daily use. Another member of the family had lived with them, but not feeling in the best of health and thinking that the food was not all that could be desired he left and went to live elsewhere. Examination of a sample of the oil yielded no positive evidence, but it may not have come from the same supply as that which had been used. Though evidence has been accumulating that mustard oil is responsible, in part if not entirely, for producing epidemic dropsy, as LAL and ROY have shown it is probable that only certain of the commercial products are toxic, for more use it for cooking without presenting symptoms than the reverse. In these cases, unfortunately, there is little evidence to support the thesis ; in fact, except that oil was used, there is no evidence of its being causative. *H. H. S.*

PASRICHA (C. L.), LAL (S.) & MALIK (K. S.). **The Specific Gravity of Serum of Epidemic Dropsy Patients.**—*Indian Med. Gaz.* 1938. May. Vol. 73. No. 5. pp. 283–284.

Eight years ago MOORE and VAN SLYKE showed that with a fall of plasma albumen below 2·5 per cent. or of total plasma protein below 5·5 per cent., when the serum has a specific gravity between 1·0227 and 1·0233, oedema occurs. Serum of six healthy subjects had a specific gravity ranging between 1·0256 and 1·0275, with a mean of 1·0263. In twelve patients suffering from epidemic dropsy, the range was from 1·0140 to 1·0235. The patient with the low figure died ten days later ; the mean of the others was 1·0223. When recovery had taken place, at all events when oedema was no longer present, the specific gravity of the serum had returned nearly to normal, the limits being 1·0246 and 1·0270 with a mean of 1·0259.

H. H. S.

Smith (Charles Edward) & Stevens (Ida May). **An Analysis of 520 Cases of Pellagra reported in California from 1928 to 1935.**—*Amer. Jl. Hyg.* 1938. May. Vol. 27. No. 3. pp. 590–614. With 5 figs. [24 refs.]

This analysis of cases of pellagra comes from the Department of Public Health and Preventive Medicine, Stanford University School of Medicine and the Bureau of Epidemiology, California State Department of Public Health.

Nine hundred and forty-two cases of pellagra were reported in the period 1920–1935; case-histories were requested in the 627 cases for the years 1928–1935; 520 case histories received were studied. They were all sporadic. There was a history of alcoholism in 42 per cent., of dietetic deficiency without alcoholism in 22 per cent., of some preceding illness in 13 per cent. Among the alcoholic cases males predominated in the proportion 62 to 35; in the non-alcoholic cases the reverse was found. Previous attack was only noted in 8·7 per cent. of alcoholic and 16·4 per cent. of dietetic deficient cases. Half the cases occurred in the 40–59 years age group. Seventy per cent. showed a February-July seasonal incidence, 50 per cent. being in months February-May with a peak in March as compared with peak in May in Baltimore and June in S. Carolina.

Two-thirds of the patients died; 92 per cent. of 146 pellagrins exhibiting dementia, diarrhoea and mouth lesions as well as dermatitis died.

Cases were predominantly urban. No institutional cases noted.

H. S. Stannus.

Lancet. 1938. Jan. 29. pp. 282–283. [19 refs.]—**Aetiology of Pellagra and the Nutritive Value of Maize.**

A leading article tracing the history of the attempt to solve the problem of the relationship of pellagra with a dietary deficiency, doubtless well-known to all those interested in the subject. Being in the nature of a review it is impossible to summarize. As regards the second part of the title the relationship of maize eating to pellagra still remains unsolved, all that can be said is that it " may be due to a deficiency of nicotinic acid in maize." [Allusion is made to the misleading indications afforded by rat feeding experiments, facts which should never be forgotten as so often the problem has seemed so simple whereas it is often very complicated.]

A short reference is made to so-called secondary pellagra and the statement is made " One may assume that in these cases the disease is caused by defective absorption of the essential dietary factor from diets in which it is not abundant . . . ." [This is an assumption; it is a common assumption but without proof.] *H. S. S.*

Ghalioungui (Paul). **On the Etiology of Pellagra.**—*Proc. Kasr El Ainy Clin. Soc.* Cairo. 1937. July. Vol. 5. No. 2. pp. 1–11. [18 refs.]

Some general remarks concerning pellagra with no new facts.

H. S. S.

DANN (W. J.). **Animal Deficiency Diseases related to Pellagra.**—*Jl. Amer. Dietetic Assoc.* 1938. Mar. Vol. 14. No. 3. pp. 157–167. [43 refs.] [Summary appears also in *Bulletin of Hygiene.*]

A history of the unravelling of the vitamin B complex is given, the only part suitable for summary being the statement of the present position regarding vitamins B_1 and B_2:

B_1 is the antineuritic factor. [Its constitution is known and it can be synthesized.]

B_2 consists of

(*a*) Lactoflavin, essential for growth in rats and chicks, prevents dermatitis in turkey poults, cataract in rats and "yellow liver" in dogs. [Constitution known and can be synthesized.]
(*b*) Nicotinic acid, cures human pellagra and black tongue in dogs. [Constitution known and can be synthesized.]
(*c*) The rat pellagra-preventing factor.
(*d*) The chick-pellagra-preventing factor, also essential for rat growth.

Douglas C. Harrison.

SCOTT (W. M.). **Pellagra Secondary to Lesions of the Gastrointestinal Tract.**—*New Orleans Med. & Surg. Jl.* 1938. Jan. Vol. 90. No. 7. pp. 403–409.

Clinical reports upon a series of fourteen cases of pellagra associated with gastro-intestinal lesions, eleven of which proved fatal. Of the fourteen cases, seven were suffering from lymphopathia venerea infection of the rectum (L.I.), two with carcinoma of the stomach, two had malignant diseases with metastasis and there were one each stricture of the oesophagus, rectal polyp, recto-vaginal fistula and amoebiasis.

[These cases resemble closely those previously reported by various authors collected together in this *Bulletin*, 1937, Vol. 34, pp. 183–204.]

H. S. S.

KAHAN (Alexander). **A Case of Pellagra.**—*London County Council Ann. Rep.*, 1936. Vol. 4. Part 3. (Med. Supp.). pp. 148–149. With 2 figs.

Report of the case of a 55-year-old woman who died in St. Alfege's Hospital with symmetrical skin lesions, stomatitis and diarrhoea. Upon these signs the diagnosis of pellagra was made; there was besides "the typical aspect of Parkinsonism."

[These cases of what might be called "terminal" pellagra are probably commoner than is generally thought.] *H. S. S.*

FAIRLEY (Keith D.). **Pellagra.**—*Roy. Melbourne Hosp. Clin. Reports.* 1937. Dec. Vol. 8. No. 2. pp. 121–124. With 2 figs. on 1 plate.

A case of pellagra in the person of a 25-year-old unmarried woman under care in the Royal Melbourne Hospital, in which extensive dermatitis was associated with gross wasting, gastro-intestinal disorder, nervous and mental changes, and oedema of the lower limbs.

The patient had given up work three years before on account of increasing weakness and constant headache, she had become mentally dull and delusional, vision and hearing had become impaired and

numbness in the feet was complained of. Just over 5 feet 1 inch in height, she weighed only 3 stone 7¾ pounds; blood pressure 120/80. Blood count showed—red cells 2,600,000, leucocytes 6,000 per cmm.; haemoglobin 49 per cent.; urine normal. Free hydrochloric acid up to a maximum of 35 cc. of decinormal caustic soda per 100 cc. of gastric contents was present in a test meal.

Other investigations showed low blood chlorides and low serum proteins; the serum calcium was however greatly increased and associated with some decalcification of the skeleton. Blood sugar curve low. Amount of ascorbic acid excreted in the urine in twenty four hours 9 mgm.

The diet was considered to have been grossly deficient. On a high protein diet with a large vitamin content improvement was rapid.

The author suggests some "possible pituitary defect with perhaps some secondary hyperparathyroidism" and refers to "the association of pellagra with endocrine dysfunction" commented on by various observers. He also refers to pellagra as "almost exclusively a disease of maize-eaters."

[The greatest caution would seem necessary in interpreting the possible association of endocrine syndromes with pellagra, cause and result may otherwise be mistaken. It is also essential to get rid of the widespread belief in the maize origin of pellagra, otherwise cases of pellagra occurring sporadically will be missed.] *H. S. S.*

Beckh (W.), Ellinger (P.) & Spies (T. D.). **Porphyrinuria in Pellagra.** —*Quarterly Jl. Med.* 1937. Vol. 6. (New Ser.). No. 23. pp. 305–319. [49 refs.]

The author's summary and conclusions are as follows:—

"1. The urinary output of porphyrin was studied in 14 cases of alcoholic pellagra, two cases of pellagra secondary to infectious disease of the gastro-intestinal tract, and three cases of healed pellagra; also as controls in 18 healthy persons, 49 persons suffering from various diseases other than pellagra, two monkeys with mild nutritional macrocytic anaemia, and five normal subjects receiving yeast, and the same number receiving liver extract. Except for one case of secondary pellagra and some of the control cases, all cases were observed at Lakeside Hospital, Cleveland, U.S.A. Urine specimens were obtained at representative stages of the disease. No extremely mild attacks of pellagra are included in our series.

"2. While the cases of endemic pellagra observed by Ellinger and Dojmi in Jugoslavia had, without exception, in the beginning of the disease, a high porphyrin output usually disappearing early in remission but always when cured, the porphyrin output of the alcoholic cases in this study showed a greater variation. In most of the latter cases the porphyrin excretion bore a rough relationship to the intensity of the skin lesions and the mucous membrane lesions as the patients were watched in their progress toward recovery. On the other hand, among the patients showing no porphyrinuria there were mild skin lesions in three cases and none in one case. The greater variability of porphyrinuria in the alcoholic pellagrins may be in relation to the history of alcoholism.

"3. Of 67 control subjects (healthy persons and those suffering from various diseases other than pellagra) only five showed an increased porphyrinuria, three of whom were receiving iron therapy.

"4. The porphyrin present in the cases of pellagra was found to be a coproporphyrin.

"5. A similarity is pointed out between the clinical symptoms of acute porphyrinuria and pellagra. One case of pellagra is described which exhibited all signs of an acute porphyrinuria.

"6. A new colorimetric method is described for the quantitative estimation of ether-soluble porphyrins in small amounts of urine.

"7. The origin of the porphyrins as well as their possible agency in the genesis of the skin lesions of pellagra is discussed. No further light was thrown on the relation between dermatitis and exposure to sunlight.

"8. The necessity for a further study of a large series of cases of pellagra of different origin is evident."

The paper should be read by all interested in porphyrinuria.

H. S. S.

SPIES (Tom Douglas), SASAKI (Yasuo) & CROSS (Esther). **A Note on the Relationship of Porphyrinuria to Human Pellagra.**—*Southern Med. Jl.* 1938. May. Vol. 31. No. 5. pp. 483–486. [10 refs.]

The article opens with a short review of the porphyrins. All consist of a system of four pyrrol nuclei united by four methylene groups. Porphyrin enters into the composition of haemoglobin and myoglobin as protoporphyrin type III united to iron and protein. Porphyrin metabolism concludes with the excretion of coproporphyrin.

Twenty cases exhibiting pellagrous glossitis, and dermatitis except in six, were maintained on a pellagra-producing basic diet. Porphyrin was excreted in large amount in all cases, to disappear from the urine when supplements of yeast, liver extract or nicotinic acid were given. Four patients received no supplement—in them the porphyrinuria slowly disappeared in the course of 4 to 6 weeks. The urine of 2 classical cases of pellagra yielded coproporphyrin I and III.

It had also been noted that nicotinic acid relieved the symptoms in a case of congenital porphyria.

The authors conclude that increased porphyrinuria is an integral part of the pellagra syndrome, the degree does not however parallel the severity of the pellagrous manifestations; nicotinic acid reduces this porphyrinuria. They suggest that a lack of nicotinic acid may be a factor in the development of pellagra and an impairment of liver function, with the result that coproporphyrin III is formed in large quantities. Coproporphyrin I and III may account for photosensitization observed in some pellagrins. *H. S. S.*

CASTELLANOS (Augustín). El sindrome pelagroide-beri-bérico. [**The Pellagroid Beriberi Syndrome.**]—*Vida Nueva.* 1937. Oct. 15. Vol. 40. No. 4. pp. 199–216. With 5 figs.

This condition, described as it occurs in Cuba, is said by the author to be the same as the Mexican *culebrilla* (ringworm disease) and the *kwashiorkor* as described by Dr. C. WILLIAMS in the Gold Coast [see this *Bulletin*, 1936, Vol. 33, pp. 410, 734; *Bull. of Hyg.*, 1936, Vol. 11, p. 311]. Any differences noted are merely differences of degree; thus the oedema is less marked in the African cases and the psychic disturbances less in Mexico. It seems to be a manifestation of vitamin deficiency, notably of vitamin B factors, and the minor or graded differences are ascribed to the fact that the diets in Mexico, in Africa and in Cuba are all deficient in vitamin B but not all equally deficient in the same factors. There are many resemblances to pellagra and particularly to experimental pellagroid and all transitions are seen between abortive cases and those with extensive erythema and generalized oedema.

Typical case of pellagroid beriberi syndrome.
[Reproduced from *Vida Nueva.*]

The only successful treatment comprises a diet of milk and vitamin B_1 and B_2 in quantity, aided in severe cases by whole blood transfusion. In those from $1\frac{1}{2}$ to 2 years of age green vegetables and fresh fruit are needed also. *H. H. S.*

SEBRELL (W. H.). **Vitamins in Relation to the Prevention and Treatment of Pellagra.**—*Jl. Amer. Med. Assoc.* 1938. May 14. Vol. 110. No. 20. pp. 1665–1672. [91 refs.] [Summary appears also in *Bulletin of Hygiene.*]

The four separate factors now known to exist in the vitamin B_2 complex are discussed—(1) lactoflavin or riboflavin, (2) nicotinic acid which is the human pellagra-preventing factor and also prevents black tongue in dogs, (3) the chick pellagra-preventing factor, and (4) the rat anti-dermatitis factor. The various aspects of treatment of pellagra are then discussed. Sunlight acts as an irritant in pellagra and pellagrins should not be exposed to sunlight, but this is a point of relatively minor importance and recovery cannot be made without

proper dietary corrections. A table is given of the pellagra-preventing power of ordinary foods to serve as a guide in the treatment of this disease. The essential points in the treatment are :—Inclusion of at least 1 quart of milk in the daily diet which should have a calorie value of 3,000–4,000 and should contain in addition to the milk, lean meats, liver and from 30–200 gm. of pure dried powdered yeast (the amount depending on the severity of the attack). In severe cases, liver extracts should be administered orally or parenterally. Recurrence can be prevented only by a change in the patient's diet.

Douglas C. Harrison.

i. Spies (Tom D.) & Aring (Charles D.). **The Effect of Vitamin B_1 on the Peripheral Neuritis of Pellagra.**—*Jl. Amer. Med. Assoc.* 1938. Apr. 2. Vol. 110. No. 14. pp. 1081–1084.

ii. Journal of the American Medical Association. 1938. Apr. 2. Vol. 110. No. 14. p. 1115.—**Thiamin Chloride and Nicotinic Acid in Pellagra.**

i. The authors had found that they were unable to make any distinction between the peripheral neuritis that they saw in pellagra and that of beriberi. They therefore determined to try the effect of giving vitamin B_1 to a series of cases of pellagra exhibiting the symptoms of neuritis. Four cases of " alcoholic " pellagra and two endemic cases were chosen. One case of each type is cited at length.

They were placed on a pellagra-producing diet. The first was then given 500 mgm. nicotinic acid orally (100 mgm. per hour for 5 hours) followed by 1 gm. in a 1 : 1000 solution daily (200 cc. by mouth 5 times a day). The mucous membrane lesions cleared in 24 hours, skin lesions showed slow improvement but the neuritic symptoms were progressively worse. Fifty mgm. crystalline vitamin B_1 then given in saline intravenously ; the mental and neurological symptoms showed improvement in two weeks. In the second, an " alcoholic " case, the skin signs had cleared up under treatment with yeast, but the peripheral neuritis persisted. Exhibition of vitamin B_1 promptly relieved the spontaneous pain. The authors find that while nicotinic acid causes the clearing up of mucous membrane lesions, Vitamin B_1 relieves the spontaneous pain of the neuritis found in certain cases of pellagra.

ii. A leading article upon the paper by Spies and Aring.

H. S. S.

Vigne (P.) & Lombard (R.). Paralysie radiale périphérique survenue au cours d'une nouvelle poussée de pellagre et guérie par un traitement vitaminique. [**Radial Nerve Paralysis in Pellagra Relapse cured by Vitamins.**]—*Marseille-Méd.* 1938. Feb. 5–15. Vol. 75. No. 4–5. pp. 119–122.

Report of a patient who, one month after leaving hospital, where he had been satisfactorily treated for pellagra, exhibited a relapse with dermatitis affecting the previously involved areas of skin. Two weeks later weakness appeared in the right arm and hand referable to the radial nerve accompanied by generalized symptoms. Bilateral optic atrophy was discovered. With polyvitaminic treatment all signs and symptoms cleared up except the optic atrophy. *H. S. S.*

SPIES (Tom D.). **The Response of Pellagrins to Nicotinic Acid.**—*Lancet.* 1938. Jan. 29. pp. 252–253.

The author and his colleagues recently (November, 1937) showed that nicotinic acid promptly relieves pellagrous glossitis, stomatitis, ptyalism, vaginitis, urethritis and proctitis and they therefrom deduced that nicotinic acid is " an antipellagric factor."

The present article deals with the results obtained during treatment of 15 persons with characteristic pellagrous symptoms and classical mucous membrane lesions. The author had previously found it difficult to judge the effect of treatment using the dermatitis as an index so that recourse is made to the rapid healing effect on mucous membranes [and in this paper no mention is made of skin lesions]. The nicotinic acid was given in 5 doses of 100 mgm. a day *per os* while the patients were kept on a basic pellagrous diet. Prompt remission of mucous membrane lesions followed and the hyper-porphyrinuria disappeared. None of these manifestations of pellagra returned so long as the patient continued to take nicotinic acid, but relapse occurred three weeks after discontinuing the treatment, relapse and return to normal being reproduced at will.

One representative case is detailed ; after treatment by nicotinic acid he was put on a full diet of milk, meat and eggs. " He was seen one month later " and " appeared in excellent health." *H. S. S.*

GRANT (Jean M.), ZSCHIESCHE (Elizabeth) & SPIES (Tom D.). **The Effect of Nicotinic Acid on Pellagrins maintained on a Pellagra-producing Diet.**—*Lancet.* 1938. Apr. 23. pp. 939–941.

Spies has elected to use a single sign in evaluating success in the treatment of pellagra; he says in the present communication " a substance can be tested for the presence of an antipellagric factor by administering it to pellagrins subsisting on a pellagra-producing diet. If after the administration of the substance, the mucous membrane lesions promptly disappear and the patients' sense of well being improves, one can conclude that the substance is potent and that it has been given in adequate amounts."

The results of observations on seven cases of pellagra form the basis of this paper. The results and conclusions are very interesting. Prompt improvement (12 to 48 hours) in the mucous membrane lesions in cases remaining on a pellagra basal diet followed upon the administration of nicotinic acid indicating " that nicotinic acid is an antipellagric factor." [It might be well to lay stress upon the indefinite article.]

When the supplements of nicotinic acid were discontinued relapse in the mucous membrane lesions occurred, promptly again relieved by resumption of nicotinic acid. A sense of well being is induced by the exhibition of this substance and coproporphyrinuria subsides.

It appears as a final conclusion that pellagra-producing diets are deficient in a number of chemical substances. A full analysis of the basal diet is given by the authors. *H. S. S.*

HAWKSLEY (J. C.). **A Case of Pellagra treated with Nicotinic Acid.**—*Lancet.* 1938. Apr. 23. pp. 944–945.

A short note concerning a case of pellagra in the person of a 28 year old schoolmaster under care at University College Hospital, treated with nicotinic acid. *H. S. S.*

Spies (Tom D.), Cooper (Clark) & Blankenhorn (M. A.). **The Use of Nicotinic Acid in the Treatment of Pellagra.**—*Jl. Amer. Med. Assoc.* 1938. Feb. 26. Vol. 110. No. 9. pp. 622–627.

Starting with the known fact that nicotinic acid is a useful remedy in "Black Tongue" among dogs, the authors set to work to determine the appropriate dosage for treating pellagra in man. This appears to be 5 doses daily of 100 mgm. each; it is said to be effective and safe. Effectiveness is defined by the authors, in their series of cases, as ability to determine the disappearance of the "fiery red" lesions of mucous membranes in pellagra. In the eleven cases studied this end was attained in all cases in 25–48 hours. The cases included 2 endemic pellagrins, 3 alcoholic cases and 6 secondary to organic disease, specially selected as presenting glossitis, stomatitis and other lesions of mucous membranes.

Obviously though the observations are interesting the relationship of nicotinic acid to pellagra as a whole remains unsettled; as the authors state, severe pellagrous skin lesions were not benefited. It was noted that all the cases were excreting large amounts of coproporphyrin I and III when they came under observation, but that this decreased under treatment with nicotinic acid.

As has been observed before the exhibition of nicotinic acid is often followed 20 minutes later by severe flushing, itching and tingling of the skin most markedly of the face and extremities. [This reaction would appear to resemble that produced by histamine; it would be interesting to know whether the distribution of pellagrous skin lesions, present or past, appeared to play any part in the distribution of the flush and also whether any effect was observed at the same time in mucous membrane lesions.] *H. S. S.*

Yudkin (S.), Hawksley (J. C.) & Drummond (J. C.). **A Case of Pellagra Successfully treated with a Filtrate Factor obtained from Liver.**—*Lancet.* 1938. Jan. 29. pp. 253–255. With 2 figs. [14 refs.]

After many "false starts" in regard to the possible relationship of vitamin B to pellagra a large number of fractions have been excluded and the factor which is now considered to give protection against human pellagra would seem to be contained in the so-called "filtrate factor" (Lepkovsky and Jukes 1936). Filtrate factor made from liver (K 50) caused rapid improvement in two pellagrins so treated by Fouts *et al.* in U.S.A. (1936).

In the present article a detailed account is given of a case of pellagra under care in University College Hospital in the spring of 1937.

A 55-years-old male who had had gastro-enterostomy performed 5 years before for duodenal ulcer exhibited the classical signs of pellagra, dermatitis of the hands, affection of the sebaceous follicles of the face, glossitis, angular stomatitis, diarrhoea, loss of weight, lowered blood pressure, and mild mental symptoms.

Investigations showed a mild anaemia, a relative increase in lymphocytes, no free acid in gastric juice but a total acidity of 12, signs of gastritis (by gastroscopy), normal blood sodium and potassium and normal phosphatase.

Vitamin A deficiency ruled out (dark adaptation test); but vitamin C deficiency present in that he did not excrete any excess until 2,500 mgm. had been given.

The patient did not improve during a week on a litre of milk nor in 5 days on a full "gastric" diet. On June 22nd he was put on to 70 ml. of liver "filtrate" equal to 500 gm. fresh liver. Improvement was immediate and on July 24th the filtrate was replaced by 1 drachm yeastrel thrice daily. By November 6th he appeared normal in every way. [It was not determined whether the "filtrate" contained nicotinic acid.] *H. S. S.*

Aykroyd (W. R.) & Krishnan (B. G.). **The Treatment of Stomatitis caused by Diet Deficiency.**—*Indian Jl. Med. Res.* 1938. Jan. Vol. 25. No. 3. pp. 643–646.

It had previously been noted in India that an angular stomatitis with a red raw eroded or fissured tongue had some definite relationship with dietetic deficiency, especially with a diet consisting almost exclusively of milled rice and only negligible quantities of vegetables and other foods; it was considered that there was a deficiency of some factor in the vitamin B_2 complex. By adding various substances to the diets of school children under observation it was found that cure of the condition resulted with yeast both unheated, autoclaved and autoclaved in alkaline solution, with eggs and with liver. The curative factor was absent in milled rice and soya beans though present in millet. It is argued therefore that it corresponded in distribution with P–P factor and the authors are faced with the problem why the consumer of milled rice in contradistinction to the maize-eater develops only one symptom of pellagra, without finding an answer.

[In this connexion it may be worth calling to mind that the reviewer some 25 years ago showed that pellagra was not necessarily associated with the consumption of maize and that it occurred among rice-eaters if their diet contained little else. Further that this condition of the lips, now commonly referred to as angular stomatitis, and sore tongue might precede the appearance of the better known symptoms of pellagra by as long as 2 years. At the same time it was shown that a condition exactly comparable to that of the lips occurred at the angles of the eyelids, at the free margin of the prepuce and about the vulva, anus and nostrils. In the present article no mention is made of these other sites; it would have been of interest had they been mentioned even if in the negative. In conclusion of this note :— Does it seem likely that the body has to be supplied with some specific chemical substance in order that the angles of the mouth shall not become sore ?] *H. S. S.*

Smith (David T.). **Present Knowledge of Pellagra : Clinical Studies.**—*Jl. Amer. Dietetic Assoc.* 1938. Mar. Vol. 14. No. 3. pp. 168–171.

A short address before the American Dietetic Association giving something of the history of the treatment of pellagra by diet.

H. S. S.

Clark (Alfred). **Experimental Pellagra in Monkeys (Hamadryad Baboons) at the Zoological Gardens, Cairo.**—*Jl. Trop. Med. & Hyg.* 1938. May 2. Vol. 41. No. 9. pp. 143–144.

Two monkeys were fed upon a diet of durra, water *ad lib.* 1 carrot and a quarter pint milk. To the diet of one dates *ad lib* were added.

While the latter remained healthy, the monkey which received no dates died nine weeks after the beginning of the diet. The author believes that the symptoms which appeared were truly pellagrous in nature and that the animal died from that disease caused by the absence of dates. He suggests that the result supports his theory concerning the inhibition of oxidation-reduction processes by mandelonitrile.

H. S. S.

British Medical Journal. 1938. Jan. 15. pp. 127–128. [36 refs.]—Modern Views on Pellagra.

Lancet. 1938. Jan. 22. p. 236.—Diseases resembling Pellagra in African Children.

East African Medical Journal. 1938. Jan. Vol. 14. No. 10. pp. 316–327. [22 refs.] Pellagra in East Africa.

Kenawy (M. R.). **On a Study of Parotid Enlargement (Hyperplasia) Endemic in Egypt.**—*Proc. Kasr El Ainy Clin. Soc.* Cairo. 1937. Oct. Vol. 5. No. 3. pp. 2–21.

Many of those who have worked among the indigenous races of warm countries have long been conversant with a chronic parotid enlargement occurring among them and articles upon the subject have appeared from time to time.

The present paper deals with the affection as seen in Egypt summarized by the author as follows :—

" (1) One hundred cases were spotted for their parotid enlargement and were analysed : *diabetic* and *endemic* groups were recognised. The latter group which comprises 90 cases was again classified into a pellagral group of 25 cases. One fifth of the endemic group had purely unilateral enlargements, the majority were bilateral cases. The condition predominated in males and the commonest age incidence was between 20 and 40 years ; few examples of familial incidence were recorded. Pellagra was found to be the commonest associated disease, and endemic cirrhosis came next to it. The claimed relationship to ankylostomiasis was ruled out. The incidence at two endemic hospitals as well as the incidence among pellagrins was worked out.

" (2) No relationship was found between the condition and any deranged gastric or pancreatic function. The degree of anaemia bore no relationship to the condition. No disturbance of the blood sugar regulating mechanism existed in the endemic group. There was no constant rise in the diastatic urinary index.

" (3) The diabetic group comprised 10 cases, five of which had diabetes, one was insulin-resistant. The other five were examples of latent diabetes. Flaum's view was quoted.

" (4) Cytological examination of the saliva showed the presence of a variety of epithelial cells and sometimes pus cells, especially when pellagra was associated. The saliva was always alkaline in reaction. Cultures and smears from the saliva were negative for organisms.

" (5) Functional tests showed the secretion of saliva to be increased with a full ptyalin content, but thiocyanate was absent.

" (6) Sialograms were found normal in 50 per cent. of the cases. Abnormalities were met with in the form of dilatation of the main duct or ductules, in the parenchyma giving rise to ' a filling defect appearance ' or as a multiplicity of the ducts giving rise to a ' leafless tree ' appearance.

" (7) Pathological study showed that the condition is a 'chronic hyperplasia,' no inflammation or inclusion bodies were detected. The sebaceous glands in pellagra were also examined.

" (8) A detailed study of the aetiology was made. Two theories were proposed and the lines of further research suggested.

" (9) An allergic study was done but the results were inconclusive.

" (10) Animal experiments including intracerebral inoculation of rabbits with parotid emulsion as well as intraglandular injection of guinea-pigs and monkeys gave negative results. Intracerebral inoculation with saliva was found unreliable because of the presence of contaminating viruses in normal and abnormal cases.

" (11) A satisfactory method of treatment by X-Ray was applied."

H. S. S.

REVIEWS AND NOTICES.

GILL (Clifford Allchin) [Colonel, I.M.S. (retd.), M.R.C.P. (London), M.R.C.S. (Eng.), D.P.H., D.T.M. & H. (Eng.), etc.]. **The Seasonal Periodicity of Malaria and the Mechanism of the Epidemic Wave.**— pp. xi + 136. With 1 map and 17 figs. 1938. London: J. & A. Churchill, Ltd., 104 Gloucester Place, Portman Square. [10*s.* 6*d.*]

This is a small monograph giving the results of a study by the author of seasonal effects in malaria and the mechanism involved in the severer types of epidemics of this disease. The author commences by distinguishing a number of epidemiological types of malaria associated with distinctive climatological features. He has been unable to do this on the basis of climatic zones or provinces recognized by climatologists, but by a classification based upon mean monthly temperature and humidity the following four epidemiological types of malaria can be correlated with the respective climatic zones, *viz.*, (1) temperate zone malaria, (2) subtropical zone malaria, (3) tropical zone malaria, and (4) equatorial zone malaria. The distinctive features of these types are clearly described and their distribution is indicated on p. 14 by a map of the world on Mercator's projection. Temperate zone malaria is characterized by an absence of malignant tertian infections. Its limits are given by a mean temperature during the hottest months of between 16° and 20°C. and a mean monthly relative humidity which never falls below 70 per cent. It is seen in its most typical form in Holland, where it has been closely studied. Epidemiologically it is distinguished by a spring epidemic, which it has been known for some time is the result of infection contracted in the previous autumn, the clinical effects not being developed at once (*i.e.*, in the autumn), but lying over as a latent or dormant malaria until the following spring. Subtropical zone malaria is typically represented in the Mediterranean area. Its limits are defined as those between 20° and 25°C. during the hottest months and a relative humidity which never falls below 50 per cent. during any month of the year. It has been intensively studied in South Italy and is characterized by two epidemic rises in the year, one in the spring and one, the more important, in the autumn. The attacks of malaria in the spring are, as in temperate zone malaria, largely due to infection contracted in the autumn, but in this case they are mostly relapses, not delayed primary infections, since they occur mainly in those who have already had an attack of malaria in the previous autumn. Tropical zone malaria owing to low temperature during the winter and extremely high temperature and low humidity during the spring and early summer is chiefly displayed as an autumnal increase. The zone is defined as that in which the mean temperature during the hottest months exceeds 25°C. and the mean monthly relative humidity is less than 50 per cent. during one or more months of the year. This is the form of malaria seen and studied in the Punjab, in the north of India, and in connexion with which the great epidemics of northern India occur. The fourth epidemiological type, or equatorial zone malaria, is characterized by both spring and autumn epidemics which are of equal magnitude. The mean monthly temperature does not fall below 25°C. and relative humidity is high (never less than 70 per cent.)

corresponding to the copious and well-distributed rainfall. Whilst in the tropical zone rainfall is the chief factor determining the degree of epidemic prevalence, in the equatorial zone the determining factor is drought. An example of an epidemic associated with this type and one for which there is much information available is the recent epidemic in Ceylon. These different types of malaria are closely studied from the point of view of the essential elements in the make up of the respective epidemic rises, that of the European types being particularly interesting owing to the very complete nature of the information which, especially as a result of recent work in Holland, is available. Among data more especially utilized by the author for this purpose are the morbidity statistics for the village of Wormerveer (pop. 3,000) during the years 1902–1923 as compiled by Kortweg (Swellengrebel, 1924). During this period of 24 years, 2,803 cases of malaria (diagnosed microscopically) came under observation, of which 390 were second relapses in the same year. Korteweg differentiated the relapses in persons whose primary attack occurred in the previous year from other relapses and he also recorded the monthly figures in respect of all these occurrences. By means of such data a complete analysis of the mean monthly malaria morbidity can be arrived at and the extent of the obscured primary infections in the autumn made apparent. An analysis on similar lines of other morbidity statistics from Holland and of those relating to the Moscow Province in Russia in 1922 and 1923 (the years of the great Russian epidemic) given by Dobreitzer very clearly demonstrates the extent of the hidden autumnal component (which may sometimes even be manifest as a definite autumnal crest in the wave) to the subsequent year's spring epidemic. Subtropical malaria has been extensively studied in South Italy. It is complicated as compared with temperate zone malaria by the occurrence in addition in the autumn of malignant tertian. The same applies to tropical zone malaria where malignant tertian is mainly responsible for the morbidity and mortality of the characteristic epidemic manifestations. It is here that the author encounters the outstanding puzzle of all the facts with which he has to deal, *viz.*, what is the mechanism which enables malignant tertian to increase so rapidly at the commencement of its epidemic prevalence, seeing that all authors are more or less agreed that this parasite does not give rise to the long relapse characteristic of benign tertian and that whenever observations have been made preceding or at the onset of the epidemic the number of gametocyte carriers has been found to be almost negligible. In the present volume the author puts forward certain evidence in support of his belief that the seasonal epidemic wave, alike with malignant as with benign tertian, is initiated by a seasonal wave of relapses. Those who are not inclined to agree that the arguments prove such an hypothesis would say that the possibilities of rapid geometric increase of infection arising from an initial very small gametocyte content in the community have been insufficiently explored. In which direction the truth lies only more complete data can finally decide. The book gives a very clear exposition, such as is not elsewhere to be found in the literature, of what is known of malaria epidemiology, using this term in, perhaps, its most correct denotation as indicating the reasons for the seasonal and epidemic variations in malaria prevalence and the major climatological aspects under which such variations occur. There is an excellent index and a very concise and useful appendix (Appendix I), giving the mean monthly temperature and

mean monthly relative humidity of selected localities in the different malaria zones as described and defined by the author.

S. R. Christophers.

CONNELL (W. K.) [M.B., Ch.B. (Glas.); F.R.C.S. (Eng.); D.T.M. & H. (Lond.), Surgical Specialist, Tanganyika Territory]. **Surgical Handbook for Hospital Assistants in the Tropics.**—pp. xv + 440. With 177 figs. 1938. London: John Bale Medical Publications, 85 Great Titchfield Street, W.1. [12*s.* 6*d.*]

In reviewing this book we find no necessity to stint praise. The publisher's work leaves nothing to be desired; good paper, clear type and lavish illustrations of proven worth heap up a measure which the coloured plates truly cause to brim over.

The Sections are well arranged and cover inflammation; surgical infections; V.D.; bones and joints; inflammations of the different organs; neoplasms and cysts; shock and haemorrhage; anti- and asepsis; wounds; burns; fractures; brain injuries; uraemia and coma; dislocations; obstruction; the acute abdomen; hernia; scrotal swellings and their diagnosis; congenital deformities; acute retention and haematuria; general and local anaesthesia; methods of examining and recording condition of patients.

The information is conveyed in plain language, is concise, and leaves the reader in no doubt as to the author's advice which, thanks to an adequate index, is readily obtained.

The scope of the book is covered by the title and dedication to "That brave and loyal-hearted gentleman the East African Native."

The knowledge conveyed is of a high standard, being that to which a first-class Assistant should aspire and no medical man overlook. Minor operations and surgical procedures are fully detailed and their limitations defined, no help whatsoever being offered on major surgery or matters rightly relegated to the purview of the medical officer. Standard treatments and tests are explained, while throughout the book both principles and practice are thoroughly up to date.

Most impressive is the sound conservatism advocated. The days when fearless incisions were made at the slightest sign of inflammation are gone and the author sees to it that they are well buried. It is refreshing to read "The best dressing for any suppurating focus is in fact its own purulent discharge, the removal of which, through a misguided zeal for cleanliness, is much to be deprecated."

Briefly then, this book is whole-heartedly recommended to Assistants, Missionaries, Nurses, aye, even to medical practitioners of whom there will be few who cannot glean fresh ideas from its pages.

A. L. Gregg.

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